From: Adams, Kelly[/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f5b6077ab72e4a7e927452b54aca5794-Adams, Kell]

Attendees: Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov; Jones, Heather M; Anderson, Meredith; Denman, Bill; Zapata, Cesar

Location: Microsoft Teams Meeting

Importance: Normal

Subject: Closure of CCR Waste in Place

Start Time: Thur 6/10/2021 4:00:00 PM (UTC)

End Time: Thur 6/10/2021 4:30:00 PM (UTC)

Required Attendees: Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov

Optional Attendees: Jones, Heather M; Anderson, Meredith; Denman, Bill; Zapata, Cesar

Rescheduling due to ADEM having a state holiday on June 7.

Hello everyone. Headquarters would like to ask Alabama a few questions about facilities electing to close with CCR waste in place.

Microsoft Teams meeting

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Ex. 6 Personal Privacy (PP)

From: Adams, Kelly[/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f5b6077ab72e4a7e927452b54aca5794-Adams, Kell]
Attendees: Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov; Jones, Heather M; Anderson, Meredith; Denman, Bill; Zapata, Cesar
Location: Microsoft Teams Meeting
Importance: Normal
Subject: Closure of CCR Waste in Place
Start Time: Mon 6/7/2021 4:00:00 PM (UTC)
End Time: Mon 6/7/2021 4:30:00 PM (UTC)
Required Attendees: Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov
Optional Attendees: Jones, Heather M; Anderson, Meredith; Denman, Bill; Zapata, Cesar

Hello everyone. Headquarters would like to ask Alabama a few questions about facilities electing to close with CCR waste in place.

Scott: I hope this date/time works for you. If not, please let me know and I will do my best to make accommodations. Feel free to invite anyone on your team that may be able to contribute to the conversation.

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From:	Adams, Kelly[/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f5b6077ab72e4a7e927452b54aca5794-Adams, Kell]
Attendees:	Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov; Jones, Heather M; Anderson, Meredith; Denman, Bill; Zapata, Cesar
Location:	Microsoft Teams Meeting
Importance:	Normal
Subject:	Closure of CCR Waste in Place
Start Time:	Mon 6/14/2021 4:00:00 PM (UTC)
End Time:	Mon 6/14/2021 4:30:00 PM (UTC)
Required Attendees:	Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov
Optional Attendees:	Jones, Heather M; Anderson, Meredith; Denman, Bill; Zapata, Cesar

Rescheduling to accommodate as many schedules as possible. If you are unable to attend, please consider appointing someone on your behalf.

Headquarters would like to ask Alabama a few questions about facilities electing to close with CCR waste in place.

Microsoft Teams meeting

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Organizer: Rollins, Rhonda[Rollins.Rhonda@epa.gov]

From: Rollins, Rhonda[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=708F6BB2524E4A13A1C033FA4A640D03-ROLLINS, RHONDA]

Attendees: Rollins, Rhonda; Yonce, Stacey; Long, Michelle; Mary Jackson; Story, S Scott; HJones@adem.alabama.gov; Egetter, David; Kroske, John; McLaughlin, Amy; Rodgers-Smith, Delores; Anderson, Meredith; Huggins, Richard; McMillan, Laura

Location: Microsoft Teams Meeting

Importance: Normal

Subject: AL CCR - Discuss ACM - w/ ORCR, RPPS

Start Time: Wed 7/8/2020 6:00:00 PM (UTC)

End Time: Wed 7/8/2020 7:00:00 PM (UTC)

Required Attendees: Yonce, Stacey; Long, Michelle; Jackson, Mary; Story, S Scott; HJones@adem.alabama.gov

Optional Attendees: Egetter, David; Kroske, John; McLaughlin, Amy; Rodgers-Smith, Delores; Anderson, Meredith; Huggins, Richard; McMillan, Laura; Simonson, Davy; Adams, Kelly

APCO Plant Barry Ash Pond ACM.pdf

APCO RESPONSE TO CCR DOCUMENTS SUBMITTED TO THE DEPARTMENT.pdf

APCO Response to ADEM 11-14-19 Letter.pdf

ADEM Response to Facility 12-30-19 Letter.pdf

Discussion of sample ACM. See Microsoft Teams link below. Please advise if others need to be included in the invite.

Please find attached the following:

- The original ACM for the Alabama Power Co (APCO) Plant Barry Ash Pond
- A comment letter ADEM sent to APCO in response to several documents, including the ACMs (for which comments are towards the back)
- APCO's response to ADEM's letter
- ADEM's response back

There is also complete groundwater investigation report that might be helpful, but it is rather large. It was too big to send in its own email, so here is the link with instructions to eFile. http://app.adem.alabama.gov/eFile/

Once on the eFile page, click Land in Media area, in the next field enter 547 and select Master ID. Then hit search. The file is the second document on the third page. The file name is: 547 XXX 097 12-15-2019 CRNR BLT COMPLETE GROUNDWATER INVESTIGATION REPORT. All other documents related to Plant Barry are under this search, so if there are other documents that anyone wants to review, this is how to access them.

Please contact Heather Jones, if you have trouble accessing the files. (334) 271-7849

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Alabama Power

Susan B. Comensky
Vice President
Environmental Affairs

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12N-0830
Birmingham, Alabama 35291

Tel 205.257.0298
Fax 205.257.4349
scomensk@southernco.com

July 11, 2019

Mr. Eric L. Sanderson, P. E., Chief
Solid Waste Branch
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, Alabama 36110-2400

Re: Assessment of Corrective Measures for the Plant Barry Ash Pond

Dear Mr. Sanderson:

Alabama Power Company is the owner and operator of the Plant Barry Ash Pond, located at Bucks, Alabama. Pursuant to 40 CFR § 257.96, rule 335-13-15-.06(7) of the regulations of the Alabama Department of Environmental Management (ADEM), and Paragraph C of ADEM Administrative Order No. 18-094-GW, please find enclosed an Assessment of Corrective Measures (ACM) for the Plant Barry Ash Pond.

The ACM is the first step in developing a long-term corrective action plan to address exceedances of groundwater protection standards (GWPS) identified at the site. As part of the ACM, potential groundwater corrective measures were identified and evaluated based on the criteria outlined in § 257.96(c) and r. 335-13-15-.06(7)(c). The closure plan for the Plant Barry Ash Pond, as reflected in the permit application package filed at ADEM in December 2018, was also considered because source control activities are integral to the long-term corrective action plan and will influence corrective measures performance at the site.

As proposed in the December permit application and the updated package to be submitted on July 15, 2019, Alabama Power plans to close the Plant Barry Ash Pond by dewatering, excavating, consolidating, and capping the ash within an impermeable composite cover system to prevent infiltration. In addition, Alabama Power will use other advanced engineering technologies beyond the minimum requirements of the CCR rule to accelerate water removal, provide additional redundancy in the dike, seal off horizontal access with a barrier wall, and seal off vertical access with an impermeable cap.

Dewatering will consist of removing the free liquids from the pond, which will reduce the volume of water available to potentially migrate from the ash pond during closure and minimize the hydraulic head within the pond, thereby reducing pressure to cause any migration from the pond. As part of ash consolidation, the closure plan proposes to excavate ash and move it back from the river by at least 100 and up to 750 yards. Construction will require the movement of approximately 8 million cubic yards of ash within the unit (out of a total volume of some 21 million cubic yards of material). The process will reduce the footprint of the area covered by ash from approximately 597 acres to 330 acres. The area of consolidation will be protected by the existing perimeter berms and an advanced engineering feature of an additional dike around the contained ash, providing redundant flood protection. The redundant dike system will be protective of inundation from a 500-year flood event with a hypothetical condition of a 1-meter sea level rise. Ongoing groundwater monitoring will provide important information that will ensure the remediation goals of the long-term corrective action plan are being met.

Alabama Power will take advantage of a geological feature that is specific to Plant Barry. Below the entire area of consolidation is a natural clay layer ranging in depth from 4 to 28 feet which creates separation from the aquifer confined beneath it. This clay layer is shown to have a measured permeability of as low as 10^{-7} cm/sec. The natural clay layer will work with enhanced engineering technologies that are built into the closure plan to provide robust source control. Additionally, we have designed a subsurface barrier wall that extends downward from the interior of the inner dike and ties into the clay layer. It has the effect of locking the subsurface of the containment area in place. An internal drainage system will be installed inside the internal dike and barrier wall on top of the clay to accelerate removal of water within the CCR and provide the ability to remove any residual water that may remain post closure.

To meet the requirements of Part C of the Administrative Order, and after a thorough consideration of available corrective measures, Alabama Power is proposing a remedial system that consists of combined source control and monitored natural attenuation at the site. The dewatering and enhanced closure design of the Plant Barry Ash Pond are expected to reduce the source contribution to groundwater such that the attenuation may be all that is needed to achieve the GWPS in a reasonable timeframe. However, using an adaptive site management process, site conditions will be monitored and necessary adjustments will be made, leading to continuous improvements in the corrective measures performance. The closure configuration includes space between the capped area and the outer dike, should Alabama Power identify a need for further action in that area.

Thank you for your consideration. Please feel free to contact me if Alabama Power can provide additional information or answer any questions.

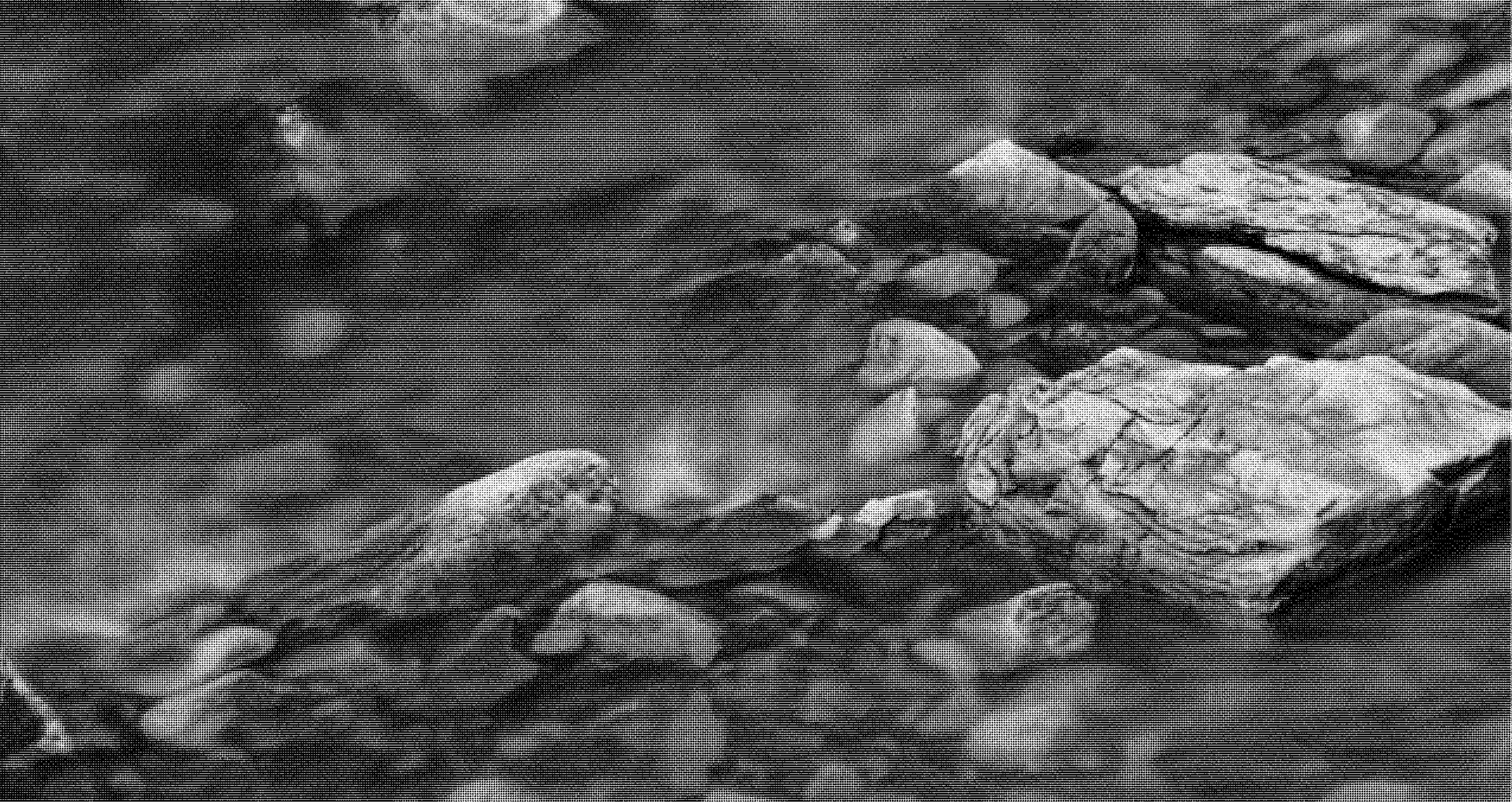
Sincerely,

Susan B. Comensky

Susan B. Comensky

Enclosures

cc w/enc.: Heather Jones
Scott Story



June 2019
Plant Barry

Assessment of Corrective Measures
Plant Barry Ash Pond

Prepared for Alabama Power Company

June 2019
Plant Barry

Assessment of Corrective Measures Plant Barry Ash Pond

Prepared for
Alabama Power Company
1313 6th Avenue North
Birmingham, AL 35203

Prepared by
Anchor QEA, LLC
One Perimeter Park South, Suite 100N
Birmingham, AL 35243

Project Number: 171114-02.01
https://anchorqea-my.sharepoint.com/personal/aaccardi_anchorqea_com/Documents/PRIVILEGED & CONFIDENTIAL_ACMs/Barry/Text/Final Submittal 6-12-19/Assessment of Corrective Measures_Barry 6-12-19.docx

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ABBREVIATIONS

ACM	Assessment of Corrective Measures
ADEM	Alabama Department of Environmental Management
Admin. Code	Administrative Code
APT	aquifer performance test
CCR	coal combustion residuals
CCR rule	80 Federal Register 21302 (April 17, 2015); "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities"
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, or Superfund
CFR	Code of Federal Regulations
cm/sec	centimeters per second
CMS	Corrective Measures Study
CSM	conceptual site model
EPRI	Electric Power Research Institute
FeS_2	pyrite
ft^2/day	foot squared per day
GWPS	groundwater protection standard
mg/L	milligram per liter
MNA	monitored natural attenuation
MSL	mean sea level
O&M	operation and maintenance
PRB	permeable reactive barrier
RCRA	Resource Conservation and Recovery Act
RCRA FIRST Toolbox	*Resource Conservation and Recovery Act Facilities Investigation Remedy Selection Track: A Toolbox for Corrective Action*
SSI	statistically significant increase
SSL	statistically significant level
USGS	U.S. Geological Survey
USEPA	U.S. Environmental Protection Agency

1 Introduction

This Assessment of Corrective Measures (ACM) has been prepared pursuant to the U.S. Environmental Protection Agency (USEPA) coal combustion residuals (CCR) rule (40 Code of Federal Regulations [CFR] Part 257 Subpart D), the Alabama Department of Environmental Management's (ADEM's) Administrative Code (Admin. Code) r. 335-13-15, and an Administrative Order issued by ADEM (AO 18-094-GW) to evaluate potential groundwater corrective measures for the occurrence of arsenic and cobalt in groundwater at statistically significant levels (SSLs) at the Ash Pond at Plant Barry (Site).

Specifically, this ACM is prepared pursuant to 40 CFR 257.96, ADEM Admin. Code r. 335-13-15-.06(7), and Part C of the Administrative Order. Pursuant to the requirements of Part C of the Administrative Order, this ACM also "include(s) the remedy proposed to the Department for approval."

This ACM was initiated within 90 days of identifying the SSLs on January 13, 2019; a 60-day extension until June 12, 2019, for completion of the ACM was documented on April 12, 2019.

This ACM is the first step in developing a long-term corrective action plan to address exceedances of groundwater protection standards (GWPS) identified at the Site. Based on the results of the ACM, further evaluation will be performed, site-specific studies completed, and a final long-term corrective action plan developed and implemented pursuant to 40 CFR 257.97–98 and ADEM Admin. Code r. 335-13-15-.06(8) and (9).

In addition to the corrective measures discussed in this ACM, APC will close the Ash Pond by excavation and consolidation of the unit's CCR material into a smaller area located within the current footprint of the Ash Pond. A final cover system will be installed that is designed to minimize infiltration and erosion. A summary of the Closure Plan was published to APC's CCR compliance webpage in November 2016.

Completing a final long-term corrective action frequently takes several years. Therefore, corrective measures presented herein can be applied as warranted based on site conditions during closure and while implementing a long-term corrective action strategy to meet remedial objectives at the Site.

1.1 Purpose and Approach

The purpose of this ACM is to begin the process of selecting corrective measure(s). This process may be composed of multiple components to analyze the effectiveness of corrective measures and to address the potential prior migration of CCR constituents to groundwater at the Site.

The CCR rule (40 CFR 257 Subpart D), ADEM Admin. Code (r. 335-13-15), and ADEM AO 18-094-GW provide requirements for an ACM. In addition, the subsequent 2016 USEPA report entitled *Resource Conservation and Recovery Act Facilities Investigation Remedy Selection Track: A Toolbox for Corrective Action* (RCRA FIRST Toolbox; USEPA 2016) provides general guidance for conducting a Corrective Measures Study (CMS) at Resource Conservation and Recovery Act (RCRA) facilities. Because a CMS is equivalent to an ACM, ACM will be used in this report for consistency with the CCR rule terminology. The RCRA FIRST Toolbox (USEPA 2016) describes three approaches for assessing the need for, or performing, an ACM at RCRA facilities:

1. **No ACM:** "This is a likely outcome when interim measures are suitable for the final remedy, when post-closure will include provisions for corrective action, or when the only additional requirements are institutional controls" (USEPA 2016). Examples where an ACM is not likely to be needed include the following:
   a. Low risk facilities
   b. Excavation/removal remedies
   c. Presumptive remedies/proven effective remedies in similar cases
2. **Limited ACM:** In some cases, the final remedy may be obvious, but additional field work, bench-scale testing, or pilot testing may be required to support the final decision. The RCRA FIRST Toolbox includes a path for additional study without requiring a full ACM.
3. **Full ACM:** USEPA recommends that a full ACM be used only when more than one viable alternative exists to meet site cleanup and other criteria. USEPA discourages creating alternatives (such as No Action) for comparison purposes only.

According to the RCRA FIRST Toolbox (USEPA 2016), a full ACM is not required in every case, and determining the appropriate level of study is the first step in an ACM. Because two Appendix IV constituents (arsenic and cobalt) were identified at the Site and several technologies are available for addressing the constituents, a full and thorough ACM was performed for the Site.

Per USEPA (2016) guidance, corrective measures that were clearly not viable were not evaluated. Initial steps in the ACM included analyzing existing Site information and developing a conceptual site model (CSM). Closure and source control plans were also considered because those activities are integral to the long-term strategy and will influence groundwater corrective measures performance. Potential groundwater correction measures were then identified and evaluated against the applicable criteria.

Frequently used technologies that are unlikely to perform satisfactorily or reliably at the Site, or that are technically impractical to implement, were not thoroughly evaluated as part of this ACM. A brief explanation is provided for each remedy not thoroughly evaluated. Though several technologies and combinations of these technologies appear viable for the Site, further evaluation of the technologies is needed to identify a remedy (or remedies) that may be implemented as part of a long-term corrective action plan.

1.2 Remedy Evaluation Criteria

Once potential remedies were identified, they were evaluated using the criteria outlined in 40 CFR 257.96 and ADEM Admin. Code r. 335-13-15-.06(7), which state that the ACM should include an analysis of the effectiveness of potential corrective measures that considers the following:

- Performance
- Reliability
- Ease of implementation
- Potential impacts of the remedy (including safety, cross-media impacts, and exposure)
- The time required to begin and complete the remedy
- Any institutional requirements (e.g., permitting or environmental and public health requirements) that could affect implementation of the remedy

These evaluation criteria, discussed in more detail in the following sections, were considered for each potential remedy.

1.2.1 Performance

Factors taken into consideration when determining the performance of a remedy include the degree to which the remedy removes released Appendix IV constituents from the environment and the ability of the remedy to achieve GWPS at compliance boundaries.

1.2.2 Reliability

Reliability includes the type and degree of long-term management (e.g., monitoring, operations, and maintenance) of a remedy, the reliability of the engineering and institutional controls to maintain the effectiveness of the remedy, potential need for replacement, or any other operational reliability issues that may arise for the remedy that will limit its use or effectiveness in meeting the corrective action objectives.

1.2.3 Ease of Implementation

Ease of implementation includes the degree of difficulty associated with installing or constructing a remedy due to Site conditions, including the need to obtain necessary approvals and/or permits from other agencies, the availability of necessary equipment and/or specialists to implement the remedy, and the available capacity and location of treatment, storage, or disposal services, if needed.

1.2.4 Potential Impacts of the Remedy

Potential impacts of a remedy include the short-term risks that might be posed to the community or the environment during implementation of the remedy (e.g., due to excavation, transportation, disposal, or containment of CCR material), potential for exposure of humans and environmental receptors to remaining CCR material following implementation of the remedy, and cross-media impacts due to the remedy.

1.2.5 Time Required to Begin and Complete the Remedy

The time required to begin and complete a remedy considers the amount of time needed to completely design and implement (i.e., begin) the remedy as well as the time it will take the implemented remedy to achieve applicable GWPS at compliance points.

1.2.6 Institutional, Environmental, or Public Health Requirements

Institutional requirements can vary from site to site and technology to technology. Any state, local, or site-specific requirements (e.g., permits), or other environmental or public health requirements, that could substantially affect construction or implementation of the remedy are considered.

2 Site Background and Characteristics

2.1 Location

Alabama Power Company's James M. Barry Electric Generating Plant is located in northeastern Mobile County, Alabama, approximately 23 miles north of Mobile, Alabama, and 1 mile east of the city of Bucks, Alabama. The physical address is 15300 U.S. Highway 43 North, Bucks, Alabama 36512. Plant Barry lies in Section 36 of Township 1 North, Range 1 West, Sections 31 and 32 of Township 1 North, Range 1 East, Section 1 of Township 1 South, Range 1 West, and Sections 5 and 6 of Township 1 South, Range 1 East. Section/Township/Range data are based on visual inspection of U.S. Geological Survey (USGS) topographic quadrangle maps and GIS maps (USGS 1980, 1982a, 1982b, 1983).

The Ash Pond is located east-southeast of the main plant, between the Mobile River and the Site barge canal. Figure 1 depicts the location of the Site with respect to the surrounding area. The Ash Pond was originally constructed in 1965, and the area designated for ash storage and disposal currently includes about 594 acres. As described in Section 2.5, ash will be consolidated into an area of approximately one-half to one-third of the initial size.

2.2 Site History

The Site is an electricity generating facility that includes coal-fired units. The Ash Pond received and stored CCR produced during the coal-fired electricity generating process. It also served as a low-volume waste treatment pond for the plant, receiving process water and stormwater from various plant sources, sluiced ash, and decant water from the gypsum pond. As of April 15, 2019, the Ash Pond ceased receipt of all CCR and non-CCR wastestreams. Per ADEM Admin Code r. 335-13-15-.09, Alabama Power Company submitted a closure plan for the Ash Pond to ADEM for review and approval, as part of the permitting package.

The Ash Pond was built on land located south of the generating units in an area having a bottom elevation of about 3 feet above mean sea level (MSL). The soils underlying the impoundment are made up of naturally occurring deposits of predominately low-permeability clays. The fill utilized to form the original embankments is of varied composition but can generally be classified as a mixture of silty and sandy clays, clayey fine sands, and sands underlain by soft organic silts and clays.

The Ash Pond was originally constructed in 1965. The pond was formed by the construction of dikes on the east, south, and west sides of the impoundment. The north side of the impoundment is natural ground that ties into the east and west dikes. Per ADEM Admin. Code

r. 335-13-15-.09, Alabama Power Company submitted a closure plan for the Ash Pond to ADEM for review and approval, as part of the permitting package.

2.3 Hydrogeological Conceptual Site Model and Groundwater Flow

The major components of the hydrogeological CSM include (Alabama Power 2018a):

- Geologic Units 1 and 2 (Figure 2)—Predominantly low permeability clays with interbedded sands in Unit 2; combined thickness generally between 20 and 35 feet; vertical hydraulic conductivities ranging from 1.1×10^{-7} centimeters per second (cm/sec) to 7.08×10^{-9} cm/sec; provide upper confining or leaky confining conditions for the uppermost aquifer, the Watercourse Aquifer (Unit 3 Sand)
- Uppermost Aquifer (Unit 3 Sand)—Described locally as the Watercourse Aquifer; located 45 to 70 feet beneath the top of the dike or 20 to 45 feet beneath top of natural ground; 50 to 60 feet in thickness; composed of silty sand with clay lenses in upper sections and fine gravel towards the base; may be separated (confined) from deeper aquifers by underlying low permeability clay (Unit 4) at depth
- An aquifer performance test (APT) was completed in the southwestern portion of the Ash Pond within the CCR and the underlying Watercourse Aquifer (Unit 3 Sand) (Geosyntec Consultants 2018):
  - Watercourse Aquifer (Unit 3 Sand):
    - Leaky confined aquifer with an incompressible aquitard and a potential infinite-source recharge boundary (i.e., the canal located 200 feet to the west of the APT area)
    - Hydraulic conductivity (K) ranged from 3.2×10^{-3} to 3.4×10^{-2} cm/sec
    - Transmissivity (T) ranged from 452 to 474 feet squared per day (ft^2/day)
    - Storativity (S) ranged from 6.2×10^{-4} to 1.4×10^{-3}
  - CCR Material:
    - K ranged from 3.5×10^{-4} to 9.2×10^{-4} cm/sec
    - T ranged from 23.4 to 58.9 ft^2/day
    - S ranged from 1.8×10^{-2} to 6.8×10^{-2}
- Six slug tests were performed at 6 of the 16 monitoring wells to estimate the horizontal hydraulic conductivity of the Watercourse Aquifer:
  - K ranged from 3.5×10^{-3} to 2.1×10^{-2} cm/sec
- Vertical K values were obtained from Shelby tube permeameter testing:
  - Unit 1 (clay and silt): K ranged from 1.15×10^{-8} to 1.40×10^{-7} cm/sec
  - Unit 1 (interbedded sand and clay): K ranged from 7.08×10^{-9} to 3.82×10^{-7} cm/sec
  - Unit 4 (clay): K ranged from 3.78×10^{-8} to 2.13×10^{-7} cm/sec

- Groundwater flow characteristics:
  - Groundwater flow occurs via porous (Darcy) flow mechanics with potential for preferential movement along more conductive sand and gravel lenses or channels.
  - Vertical groundwater flow in upper strata is likely retarded by low permeability clays.
  - Groundwater recharge is likely occurring from the barge canal and outcropping connected sand units to the west.
  - Groundwater flows horizontally from west to east towards the Mobile River in an arcuate pattern matching the geometry of the river with some components of northerly and southerly groundwater flow.
  - Horizontal hydraulic conductivity values in the uppermost aquifer average 3.3×10^{-3} cm/sec (9.4 feet per day), as determined from pump testing.
  - Groundwater flow velocity is calculated at a relatively slow rate of 0.008 foot per day and is influenced heavily by low hydraulic gradients across the Site.

Groundwater elevations fluctuate in response to rainfall and Mobile River stage. Seasonal variations of 5 to 7 feet are typical at the Site. These fluctuations are consistent in monitoring wells across the Site, indicating a relatively uniform response to rainfall events and fluctuations of the discharge canal and Mobile River. A typical potentiometric surface map is presented in Figure 3. Groundwater elevation data indicates that water levels tend to be higher in the early spring and lower during the fall and winter seasons. Table 1 provides a summary of historical groundwater elevation data for the Site.

2.4 Delineation of Appendix IV Constituents

The groundwater monitoring network is composed of 16 monitoring wells installed around the Ash Pond (Figure 3 and Table 2): 3 upgradient and 13 downgradient. Monitoring well locations MW-2 through MW-4 serve as upgradient locations for the Ash Pond, as determined by water level monitoring and potentiometric surface maps constructed for the Site. Upgradient wells are screened within the same uppermost aquifer as downgradient locations and are representative of background groundwater quality at the Site. Monitoring well locations MW-1 and MW-5 through MW-16 are utilized as downgradient locations for the Ash Pond, as determined by water level monitoring and potentiometric surface maps constructed for the Site.

Background sampling occurred between March 2016 and June 2017. Compliance detection sampling began following completion of background sampling, with sampling occurring in September 2017. Statistically significant increases (SSIs) of Appendix III constituents were noted during the September 2017 compliance detection sampling event, as described in the *2017 Annual Groundwater Monitoring and Corrective Action Report* (Alabama Power 2018b). The

Appendix III SSIs triggered assessment sampling for Appendix IV constituents, with sampling events occurring in January, May, and November 2018. Appendix III and IV Maximum Contaminant Level and CCR-rule-specified GWPS values are shown in Table 3. The May and November 2018 sampling events noted Appendix IV constituents arsenic and cobalt at SSLs above GWPS. SSLs above the GWPS for arsenic (0.01 milligram per liter [mg/L]) and cobalt (0.006 mg/L) from the May and November 2018 sampling events are summarized as follows:

- Arsenic was reported at SSLs above the GWPS at the following monitoring wells: BY-AP-MW-1, BY-AP-MW-5, and BY-AP-MW-7 through BY-AP-MW-15 for both May and November 2018 sampling events.
- Cobalt was reported at SSLs above the GWPS at monitoring wells BY-AP-MW-7, BY-AP-MW-15, and BY-AP-MW-16 during the May 2018 sampling event. Only one downgradient well, BY-AP-MW-15, was reported at SSLs above the GWPS during the November 2018 sampling event.

Note that while arsenic and cobalt concentrations did exceed the GWPS at some wells during the May and November 2018 sampling event, concentrations were generally only slightly above the GWPS. Detected concentrations ranged from approximately 0.001 to 0.08 mg/L for arsenic and 0.003 to 0.03 mg/L for cobalt (Tables 4 and 5). One upgradient monitoring well, BY-AP-MW-2, also exceeded the GWPS for cobalt in November 2018.

To delineate groundwater impacts, additional monitoring wells consisting of seven vertical delineation wells and six horizontal delineation wells have been planned and or installed at locations downgradient of monitoring wells where Appendix IV SSIs were observed. To date, the installation of six vertical delineation wells, three horizontal delineation wells, and three ash pore-water piezometers have been completed. The remaining scope could not be completed during the wet season as areas where horizontal delineation wells were planned were not accessible to drill rigs due to wet and unsafe field conditions. These locations will be re-attempted during the relatively drier months of June, July, or August of 2019. Vertical delineation wells were installed at the base of Unit 3 Sands between depths of 100 and 115 feet below ground surface and generally screened just above the Unit 4 Clay. The remaining horizontal delineation wells will be installed in the upper and middle portions of Unit 3 along the eastern and southern waste boundaries.

To discern the nature of source, pore water samples from three locations within the Ash Pond were collected and analyzed for Appendix III and IV constituents. The results indicate that cobalt is either not present or remains in the in-place solid material. Therefore, an alternate source demonstration for cobalt is under consideration for the Site.

2.5 Pond Closure and Source Control

Closure of the Plant Barry Ash Pond will be accomplished by dewatering, consolidating and capping the ash with a final cover system. Dewatering is estimated to last several years. The mechanical treatment system will be adjusted to 1) control Ash Pond drawdown at a rate to ensure structural integrity of the impoundment is maintained as determined by the Dam Safety Engineer, and 2) manage fluctuating site conditions due to the decrease of the Ash Pond volume as well as the addition of rainfall. This will effectively control the source of CCR constituents to groundwater by removing free liquid from the ash, reducing the area of ash, and preventing further infiltration through the ash. The Plant Barry Ash Pond will be closed by leaving CCR in place and consolidating the current site footprint of approximately 597 acres to an area of approximately 330 acres. The current closure plan estimates that dewatering, consolidation and capping will be completed in 2031.

As part of the ash consolidation, the Ash Pond will be dewatered sufficiently to remove the free liquids. Removing free liquids will reduce the volume of water available to migrate from the Ash Pond during closure and minimize hydraulic head within the pond, thereby reducing pressure to cause migration from the Ash Pond. A reduction of hydrodynamic forces that lead to outward or downward migration will also allow the natural, low permeability clay directly underlying the Ash Pond to more effectively confine vertical seepage. CCR will be consolidated into a smaller footprint and graded to create a subgrade for the final cover system. Excavation will include removing all visible ash and over excavating into the subgrade soils. Additionally, an internal toe drain system will be installed near the perimeter of the consolidated footprint at an approximate elevation of 1 feet above mean sea level during closure and left in place post-closure. This internal toe drain will be used during closure and through post-closure to aid dewatering activities and collect residual pore water. Collected pore water will be conveyed to the water treatment plant.

The final cover will be constructed to control, minimize or eliminate, to the maximum extent feasible, post closure infiltration of liquids into the waste and potential releases of CCR from the unit. This will be prevented by providing sufficient grades and slopes to: 1) preclude the probability of future impoundment of water, slurry, or sediment; 2) ensure slope and cover system stability; 3) minimize the need for further maintenance; and, 4) be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.

The final cover system will be designed to minimize infiltration and erosion. The current design for the cover system is the synthetic ClosureTurf® cover system that utilizes a 50-mil LLDPE geomembrane overlain by an engineered synthetic turf. The synthetic turf will contain a minimum ½ inch sand infill. The permeability of the final cover system will be significantly less than the permeability of the natural subsoils beneath the surface impoundment. Final design will ensure the disruption of the integrity of the final cover system is minimized through a design that accommodates settlement and subsidence, in addition to providing an upper component for protection from wind or water erosion.

3 Groundwater Corrective Measures Alternatives

3.1 Objectives of the Corrective Measures

Following 40 CFR 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b), the following summarizes the criteria that must be met by the remedy:

- Protect human health and the environment.
- Attain applicable GWPS.
- Control the source of the release so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents to the environment.
- Remove from the environment as much of the material released from the CCR unit as is feasible, considering factors such as avoiding inappropriate disturbances of sensitive ecosystems.
- Comply with any relevant standards (i.e., all applicable RCRA requirements) for management of wastes generated by the remedial actions.

All corrective measures selected for evaluation for potential use at the Site are anticipated to satisfy the above performance criteria to varying degrees of effectiveness.

3.2 Potential Groundwater Corrective Measures

The following presents a summary of potential groundwater corrective measures evaluated as part of this ACM. Based on Site-specific information and knowledge of corrective alternatives, the following remedies—or combination of remedies—are being considered using the evaluation criteria specified in 40 CFR 257.96(c) and ADEM Admin. Code r. 335-13-15-.06(7)(c):

- Monitored natural attenuation (MNA)
- Hydraulic containment (pump-and-treat)
- Permeable reactive barriers (PRBs)
- Subsurface barrier walls
- Geochemical manipulation (in situ injection)

Two frequently considered remedies, 1) phytoremediation and 2) in situ grouting, were not considered viable at the Site. Conventional phytoremediation for inorganic constituents may be effective for impacts at or near the ground surface. Appendix IV SSLs occur in groundwater at depths below 10 to 20 feet and phytoremediation would not be effective at those depths. The TreeWell phytoremediation technology may be effective to depths of 50 feet (possibly more), but trees do not bioaccumulate arsenic and cobalt and would not transpire a sufficient amount of water to achieve hydraulic containment in the hydrogeologic conditions at the Site.

In situ grouting was not considered because the grain size is too fine and the low permeability of the Unit 3 sand will impede the horizontal distribution of the grout, thus rendering it impractical.

3.2.1 Monitored Natural Attenuation

MNA has been a component of corrective action at RCRA and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) sites since the 1990s. MNA describes a range of physical and biological processes in the environment that reduce the concentration, toxicity, or mobility of constituents in groundwater. For inorganic constituents, the mechanisms of natural attenuation include biostabilization, sorption, dispersion, and precipitation (USEPA 1999, 2007a, 2007b). MNA as a remedial alternative depends on a good understanding of localized hydrogeologic conditions and may require considerable information and monitoring over an extended period of time. MNA is not an approach that will lead to rapid closure of a site and is frequently used in combination with other remedies at a site.

Where site conditions are conducive to MNA, it has the potential to provide a more sustainable, lower-cost alternative to aggressive remediation technologies such as pump-and-treat. The Electric Power Research Institute (EPRI) has prepared a document describing implementation of MNA for 24 inorganic constituents (EPRI 2015a).

USEPA defines MNA as follows (USEPA 1999, 2015):

> The reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a timeframe that is reasonable compared to that offered by other more active methods. The "natural remediation processes" that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater.

When properly implemented, MNA removes constituents from groundwater and immobilizes them onto aquifer solids. Decisions to utilize MNA as a remedy or remedy component should be thoroughly supported by site-specific data and analysis (USEPA 1999, 2015).

According to USEPA (2015) guidance, a four-phase approach should be used to establish whether MNA can be successfully implemented at a given site. The phases (also referred to as "steps" or "tiers") include the following (USEPA 1999, 2007a):

1. Demonstrate that the extent of groundwater impacts is stable.
2. Determine the mechanisms and rates of attenuation.
3. Determine if the capacity of the aquifer is sufficient to attenuate the mass of constituents in groundwater and that the immobilized constituents are stable and will not remobilize.
4. Design a performance monitoring program based on the mechanisms of attenuation and establish contingency remedies (tailored to site-specific conditions) should MNA not perform adequately.

Based on MNA case histories for inorganic constituents, MNA timeframes range from a few years to decades (EPRI 2015a). Because pond closure activities (consolidation and capping) at the Site are projected to take approximately 12.5 years, the timeframe for MNA is compatible with the closure period.

Attenuation mechanisms can be placed in two broad categories, physical and chemical. Physical mechanisms include dilution, dispersion, flushing, and related processes. All constituents are subject to physical attenuation mechanisms, so physical processes should be considered in MNA evaluations. In its most recent guidance, USEPA (2015) discourages using dilution and dispersion as primary MNA mechanisms, as these mechanisms disperse contaminant mass rather than immobilize it. Further, USEPA (2015) advises that dilution and dispersion may be appropriate as a polishing step (e.g., at the boundaries of a plume, when source control is complete, an active remedy is being used at the Site, and appropriate land use and groundwater controls are in place).

Common chemical mechanisms of attenuation for inorganic constituents include adsorption to, or coprecipitation with, oxides and hydrous oxides (oxyhydroxides) of iron and manganese; coprecipitation with, and adsorption to, iron sulfides such as pyrite (FeS_2); and precipitation as carbonates, sulfides, sulfates, and/or phosphates (USEPA 2007b).

Arsenic and cobalt are subject to physical attenuation mechanisms and are also chemically attenuated (e.g., by sorption to naturally occurring oxyhydroxides of iron and other metals, and by coprecipitating with common minerals such as iron sulfides). Therefore, MNA is a potentially viable corrective measure for groundwater at the Site.

3.2.2 *Hydraulic Containment (Pump-and-Treat)*

Hydraulic containment utilizes pumping wells (and sometimes injection wells, trenches, galleries, and/or trees) to contain and prevent the expansion of impacted groundwater. Effective hydraulic containment uses pumping wells or other subsurface hydraulic mechanisms to create a horizontal and vertical capture zone or a hydraulic barrier. After pumping, the water may be reused in beneficial applications or treated, discharged, or reinjected. Hydraulic containment is one of the most mature corrective action technologies, and it is described in *Pump-and-Treat Ground-Water Remediation: A Guide for Decision Makers and Practitioners* (USEPA 1996) and *Groundwater Contamination, Optimal Capture and Containment* (Gorelick et al. 1993).

Due to the Unit 3 Sand (Watercourse Aquifer) hydraulic characteristics established during the aquifer performance testing, hydraulic containment could be implemented within the Unit 3 Sand. Because arsenic and cobalt are treatable by commonly used technologies, pump-and-treat is a potentially viable corrective measure for groundwater at the Site.

3.2.3 *Permeable Reactive Barrier Walls*

A PRB wall is the emplacement of chemically reactive materials in the subsurface to intercept impacted groundwater, provide a flow path through the reactive media, and capture or transform the constituents in groundwater to achieve GWPS downgradient of the PRB (Powell et al. 1998).

EPRI (2006) provides an overview of PRBs and possible PRB reactive media for constituents from CCR. The PRB is an in situ technology that allows impacted water to flow through the media and provides a barrier to constituents rather than to groundwater flow. PRBs can be used to treat groundwater impacted with metals and metalloids, chlorinated volatile organic compounds, petroleum hydrocarbons, and radionuclides. The main processes by which a PRB is used to remediate groundwater are transformation and immobilization. Transformation, or conversion, involves transforming a constituent to a less toxic form such as chemical reduction of chromium (VI) to chromium (III). Immobilization is of the most interest with respect to inorganic constituents such as those from CCR sites. Immobilization of constituents takes place through precipitation from the dissolved state or through sorption to reactive media in the PRB (Powell et al. 2002; EPRI 2006).

There are two design configurations for PRB walls (ITRC 2005; EPRI 2006):

- Continuous PRBs are ones in which the reactive media extend across the entire path of the plume. These should have minimal impact on groundwater flow and do not necessarily have to be tied to a low hydraulic conductivity unit, although that would be dependent on the depth of impacts and would safeguard against constituents flowing under the PRB if permeability of the reactive media was reduced.

- Funnel-and-gate systems incorporate barrier walls to control and direct flow to the reactive gate. The funnels can be constructed of sheetpiles, bentonite, or other barrier wall material. Similar to barrier walls used for containment, funnels must be tied into a confining bed or low hydraulic conductivity unit to avoid having impacted water flow under the wall. Funnels can also be placed in zones of greatest contaminant mass flux through the aquifer, to maximize efficiency of treatment. The use of a funnel can cause a significant increase in groundwater flow velocity, which must be considered in designing the reactive portion of the wall for residence time. The funnel must be designed to extend beyond the extent of the plume to avoid end-around flow.

Groundwater residence time through the gate needs to be sufficient to allow capture of the constituents as groundwater moves through the reactive media.

Site characterization is especially important with PRBs to allow proper design where groundwater flows naturally through the reactive media. An understanding of the following site and constituent characteristics is crucial to the success of the system (Powell et al. 1998; EPRI 2006):

- The permeability of the reactive zone, which must be kept greater than or equal to the aquifer to avoid diverting flow away from the PRB
- An understanding of the groundwater impact area boundaries and flow paths
  - The reactive media and funnel system, if used, must be properly designed and placed such that the groundwater will not bypass or be diverted around or under the system.
  - Excessive depth and fractured rock are difficult for placement of media.
- The geochemistry of the constituents and how they will interact with the reactive media
- Determination of how quickly groundwater will move through the reactive media to calculate residence time of the impacted groundwater
- The ability of the reactive media to remove constituents from groundwater yet remain reactive for an extended period

Major considerations in selecting reactive media for PRBs include the following (Gavaskar et al. 1998; EPRI 2006):

- Reactivity: The media should have adequate reactivity to immobilize a constituent within the residence time of the design.

- Hydraulic performance: The media should facilitate adequate flow through the PRB, which usually means it has a greater particle size than the surrounding aquifer media. Alternatively, gravel may be placed upgradient of PRBs to direct flow through them.
- Stability: The media should remain reactive for an amount of time that makes its use economically viable compared to other technologies.
- Environmentally compatible by-products: The media should not release by-products that are not environmentally acceptable in the aquifer environment. For example, media should not produce excess alkalinity (or acidity) such that pH is raised (or lowered) to unacceptable levels.
- Availability and price: The media should be easy to obtain in large quantities at a price that makes the PRB economically feasible.

Inorganic constituents have been shown to be amenable to remediation using PRB technology when using the appropriate reactive media. These include arsenic, chromium, sulfate, selenium, nickel, lead, uranium, technetium, iron, manganese, copper, cobalt, cadmium, zinc, molybdenum, nitrate, and phosphate (McGregor et al. 2002; EPRI 2006; EPRI 2015a; Dugan 2017).

A PRB can be installed through trenching, or soil excavation, in a similar manner as a slurry wall. A biopolymer slurry is used to stabilize the trench walls during excavation. The biopolymer is usually guar gum-based to allow microbial breakdown of residual slurry after placement of the reactive media. The reactive media is placed through the slurry by tremie. The depths are limited to about 90 feet, or the depth a trench can be kept open (ITRC 2005).

Due to the hydraulic characteristics of the Unit 3 Sand (Watercourse Aquifer), the presence of a laterally extensive lower confining bed (Unit 4 Clay), and the availability of reactive media for inorganic constituents, the PRB wall is a potentially viable corrective measure for groundwater at the Site. The depth required at the Site, however, is approaching the limit for a PRB wall.

3.2.4 Vertical Barrier Walls

Vertical barrier walls are used to stop the flow of groundwater and any constituents that groundwater contains. Though effective, vertical barrier walls may serve as groundwater dams, so hydraulic containment to address mounding of groundwater behind barrier walls or flow of groundwater around the ends of barrier walls should be considered.

Bentonite slurry walls have been used for decades to control the flow of groundwater in both environmental applications as well as general foundation construction. Soil-bentonite walls are constructed by excavating a narrow vertical trench and injecting bentonite slurry to support the trench walls. The bentonite slurry used to support the trench walls is generally a mixture of pulverized bentonite in water. Water from the slurry bleeds into the trench wall, leaving behind a mat of particles known as filter cake, which along with the hydrostatic force of the slurry, holds the trench open. Once the trench reaches final grade, the trench is backfilled with a mixture of soil from the excavation, slurry, and soil from other sources, as necessary, to achieve the desired properties of strength and hydraulic conductivity. The backfill is generally placed with a tremie, clamshell, and/or a bulldozer, displacing the trench support slurry. The filter cake remains in place and, along with the gradation of the backfill used in the wall, is a function of the hydraulic conductivity of the final wall. Installation of soil-bentonite barrier walls can require significant amounts of space for mixing backfill (Bliss 2014). At CCR facilities, berms may be constructed to provide the working space for barrier wall emplacement.

Cement-bentonite barrier walls are similar to soil-bentonite walls except that the stabilizing fluid used during excavation is a cement-bentonite water mix. The slurry remains in place to form the wall, so a separate operation to mix the backfill and displace the slurry is not necessary. Because the excavated material is not used in the backfill mix, significant amounts of spoil are generated with this type of barrier wall. Also, due to the method of excavation with the slurry, there can be a significant amount of slurry waste (up to 40% of the total trench/panel volume) during excavation (EPRI 2015b).

Barrier walls used alone at the Site could produce groundwater mounding, with possible rise of groundwater to the surface, and could produce groundwater flow around the end of the barrier walls. However, barrier walls could be used to improve the subsurface hydraulic (flow) conditions for PRB walls and pump-and-treat. For example, barrier walls could form the impermeable portions of a funnel-and-gate PRB wall to direct groundwater to the treatment gates containing reactive media and could be used in a similar way to direct groundwater toward pumping wells in a pump-and-treat system. Because they could be part of PRB or hydraulic containment (pump-and-treat) systems, barriers walls are potentially viable corrective measures at the Site. Note that to be effective for environmental applications, barrier walls should be tied into a continuous, relatively impermeable layer such as the Unit 4 Clay at the Site.

3.2.5 Geochemical Manipulation (In Situ Injection)

Geochemical manipulation usually via subsurface injections, is an emerging remediation technology for inorganic constituents in groundwater. Geochemical manipulation for inorganic constituents may be applied in three modes: redox manipulation; adsorption to iron or other metal oxyhydroxides under oxidizing groundwater conditions; and adsorption to, or coprecipitation with, iron or other metal sulfides under reducing conditions (sequestration in sulfides).

Redox manipulation has been applied to metals such as chromium since the 1990s, where reducing compounds are injected to chemically reduce chromium (VI) to the more benign chromium (III) (USEPA 2000; Ludwig et al. 2007). Geochemical processes such as adsorption and coprecipitation are applicable to arsenic and cobalt. In adsorption under oxidizing conditions, an iron source (such as ferrous sulfate) is injected into the subsurface and oxidizes to iron oxyhydroxides (ferrihydrite) to which contaminants adsorb (Pugh et al. 2012; Redwine et al. 2004). Due to the generally mildly reducing conditions at the Site, sequestration in sulfides is potentially the most viable of the geochemical manipulation technologies.

In the sequestration-in-sulfides technology, soluble sources of organic carbon, ferrous iron, and sulfate are injected into the subsurface to optimize conditions for sulfate-reducing bacteria growth (Saunders 1998). Sulfate-reducing bacteria produce sulfide minerals as a by-product of their metabolism, and constituents are removed from groundwater and immobilized by the sulfide minerals. Trace constituents substitute for other elements in the sulfide mineral structure and are adsorbed to sulfide mineral surfaces. In recent successful applications for arsenic, a treatment solution containing molasses, ferrous sulfate heptahydrate, and small amounts of commercial fertilizer dissolved in unchlorinated water were injected to significantly decrease arsenic concentrations in groundwater.

The following inorganic constituents may be removed from groundwater by sulfide mineral formation: antimony, arsenic, cadmium, cobalt, copper, mercury, lead, molybdenum, nickel, selenium, thallium, and zinc, in addition to some rarer elements (Abraitis et al. 2004; EPRI 2015b). The most common sulfide minerals include the iron sulfide family (FeS, FeS_2), though many other sulfide minerals are documented.

Because of the generally mildly reducing groundwater conditions at the Site, and effectiveness for arsenic and cobalt, sequestration in sulfide minerals is a potentially viable for corrective action at the Site. Because the technology has not yet been demonstrated for large areas, its optimum application may be treatment of isolated areas (e.g., in the vicinity of a few impacted wells).

3.3 Potential Remedy Evaluation

3.3.1 Introduction

The following remedies are considered potentially viable for corrective measures for groundwater at the Site:

- MNA
- Hydraulic containment (pump-and-treat)

- Funnel-and-gate PRB wall
- Vertical barrier walls as components of other corrective measures
- Geochemical manipulation (injections), particularly sequestration in sulfide minerals

Although these technologies are potentially feasible remedies, further data collection and evaluation are required to: 1) verify the feasibility of each; and 2) provide sufficient information to design a corrective action system that meets the criteria specified in 40 CFR 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b). Table 6 provides a summary of these technologies compared to the evaluation criteria discussed in Section 1 as applied to Site conditions. Table 7 discusses advantages and disadvantages of each technology that should be considered.

3.3.2 MNA

MNA is compatible with the other groundwater corrective actions that are potentially viable for the Site. At a minimum, MNA can serve as a polishing step (USEPA 2015), which may be all that is needed at the Site due to source control and the small reduction in constituent concentrations required to meet GWPS.

The performance of MNA requires further investigation, especially related to the identification of attenuating mechanisms, capacity of Unit 3 for attenuation, and time to achieve GWPS. Because Unit 3 is a sandy aquifer, the capacity for attenuation may not be as high as in an aquifer that contains more fines (silt and clay) or organic material. Therefore, MNA performance is considered medium in the absence of additional data. Dewatering, consolidation, and capping of the Ash Pond, however, will likely reduce the source contribution to groundwater such that the attenuation capacity of Unit 3 may be sufficient to achieve GWPS in a reasonable timeframe.

Implementation of MNA at the Site will be relatively easy. Most of the wells for MNA are already in place, though a few additional wells may need to be installed to monitor progress in critical areas. Solid (e.g., aquifer) samples will need to be collected to identify attenuating mechanisms and to test capacity, permanence, and help determine the time required to achieve GWPS.

Reliability of MNA will be relatively high because MNA requires almost no operation and maintenance (O&M). Potential impacts of the remedy will be negligible because MNA is non-intrusive and produces no effluents or emissions.

Implementation of MNA would require some geochemical studies and possibly the installation of some new wells. Because MNA does not require design and construction of infrastructure other than new monitoring wells, it can be initiated within 6 months to a year. At least 1 year of groundwater monitoring data is recommended before implementation of MNA is considered complete. The additional data would be needed for statistical analysis and to determine if additional monitoring wells need to be installed. Therefore, complete implementation of MNA would take about 18 to 24 months.

Time for MNA to achieve GWPS is currently unknown and would require additional studies. Published and unpublished case histories for arsenic, and by inference cobalt, suggest that MNA would take 2 decades or more to achieve GWPS. However, the timeframe at the Site may be less because of the source control measures (dewatering, consolidation, and capping) and the fact that groundwater monitoring data for arsenic and cobalt are only slightly above the GWPS.

3.3.3 Hydraulic Containment (Pump-and-Treat)

Hydraulic containment via pump-and-treat has been used for groundwater corrective action for decades. When the pump-and-treat system is online, the performance is considered high: arsenic and cobalt are readily treated, and if the system subsurface hydraulics are designed properly, the area of impact will stabilize or shrink. Because these systems require substantial O&M, the reliability is considered not quite as high as some other technologies. In other words, pumps, piping, and the water treatment system must be maintained and will be offline occasionally for various reasons.

Similarly, hydraulic containment is not as easy to implement as some other technologies (e.g., MNA or geochemical manipulation), due to design, and installation of wells, pumps, and piping. An on-site water treatment plant would be required to accommodate both the quantity and constituents in the pumped groundwater. Because the quantity of water requiring treatment cannot be ascertained without further study, the design parameters of the treatment system would also need to be verified through additional investigations.

Hydraulic containment could probably be designed and installed within 1 to 2 years. Based on published and unpublished case histories, time to achieve GWPS could take a decade or more due to the slow desorption kinetics of arsenic and cobalt from the Unit 3 aquifer, though both the planned source control and MNA should accelerate this process.

Regulatory requirements and institutional controls may be greater for hydraulic containment than some of the other technologies. For example, permits may be required for the withdrawal and re-injection (if used) of water, and the chemistry of the effluent after treatment would need to be compatible with the National Pollutant Discharge Elimination System permit.

Active technologies such as hydraulic containment (pump-and-treat) may offer few or no advantages over MNA. For example, pump-and-treat for arsenic, cobalt, and other inorganic constituents may reach a point of diminishing returns relatively quickly (few months to a few years), as the concentration decreases and the subsequent reduction in concentration changes very little through time (EPRI 2018). The diminishing rate of concentration reduction is likely due to the slow desorption kinetics of constituents from aquifer solids (Bethke and Brady 2000; USEPA 2000). Due to the slow desorption kinetics, pump-and-treat may take a decade or more to achieve GWPS, such that it offers no time advantage over MNA (EPRI 2018).

3.3.4 Permeable Reactive Barrier Walls

PRB walls may be installed with continuous reactive media or with impermeable sections punctuated by reactive treatment gates (funnel-and-gate configuration). The funnel-and-gate configuration directs flow through the reactive gates, thereby improving treatment efficiency. Because of the large area to be treated, and increased efficiency of the system, the funnel-and-gate configuration is envisioned for the Site.

When working effectively in suitable conditions, PRB walls can reduce constituents to GWPS downgradient of the walls. However, because of site-specific uncertainties associated with the reactive media and subsurface hydraulics, performance is considered medium to high. Similarly, because the reactive media is expended and may clog through time, and will need to be replaced at some point, reliability is considered to be medium. Further technology-specific evaluation is required to more definitively determine the feasibility of implementing a PRB at the Site.

Due to the required depth of the PRB at the Site (approaching the maximum depth limit), and that mixed media may be required to treat the constituents, implementation may be moderately difficult. Alteration of subsurface hydraulics (flow) may be a potential impact of this remedy. Because of required laboratory treatability studies on the reactive media, and depth of the wall, time to implement the remedy is estimated to be 2 to 4 years. Time to achieve GWPS is estimated to be at least a decade or more, though a groundwater model could help to better define this period.

3.3.5 Vertical Barrier Walls

Vertical barrier walls, such as slurry walls, would not be applied alone at the Site due to the potential for groundwater rise to the surface and flow of impacted groundwater around the ends of walls. Impermeable barrier walls could be used to enhance the subsurface hydraulics for other treatments, for example, as impermeable sections between pumping zones, or impermeable sections between reactive gates in a funnel-and-gate PRB wall.

Subsurface vertical barrier walls are a widely used and accepted technology, with relatively high performance and reliability. Implementation at the Site could be moderately difficult due to the depth of the wall. Potential impacts of the remedy include alteration of subsurface hydraulics (flow).

Due to the depth of the wall, time to implement the remedy (construct the wall) could be 1 to 2 years, and time to achieve GWPS would be the same length of time as the companion technology (i.e., hydraulic containment or PRBs).

3.3.6 Geochemical Manipulation (In Situ Injection)

Geochemical manipulation (injection) is an emerging technology for inorganic constituents. The permanence of geochemical manipulation has not yet been demonstrated, due to its short history of application; therefore, performance is not considered high at present. Similarly, reliability is considered medium or moderate because Site geochemical conditions should not change beyond the tolerance of the treatment. The most effective use of this technology at the Site is probably for smaller isolated areas, where performance can be readily monitored and re-treatment applied if needed.

Geochemical manipulation is relatively easy to moderate to implement, particularly in small areas. The main infrastructure required are injection wells, though the treatment solution may be injected through direct-push drill rigs. Even though infrastructure requirements are minimal, some laboratory and/or field pilot test work will need to be done, and a state underground injection control permit may be required, so geochemical manipulation is estimated to require a few years to implement. Because the longevity of this technology has not yet been demonstrated and multiple injections may be required, up to a decade or more may be needed to achieve GWPS.

4 Remedy Selection

Pursuant to 40 CFR 257.97 and ADEM Admin. Code r. 335-13-15-.06(8), after completing this ACM, the Site must select a remedy as soon as feasible. In contrast, Part C of the Administrative Order states that this ACM must include the remedy proposed to the Department for approval.

To meet the requirement of Part C, the Site remedy is proposed to consist of the following:

1. Source control by dewatering the Ash Pond, consolidating the CCR material, and capping it with a low-permeability cover system to prevent infiltration
2. MNA with routine evaluation of system performance to ensure that remediation goals are being met
3. Adaptive site management and remediation system enhancement or modification to ensure that remediation performance goals are met

40 CFR 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b) specify the following criteria that must be met by the remedy:

- Protect human health and the environment
- Attain applicable GWPS
- Control the source of the release so as to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents to the environment
- Remove from the environment as much of the material released from the CCR unit as is feasible, considering factors such as avoiding inappropriate disturbances of sensitive ecosystems
- Comply with any relevant standards (i.e., all applicable RCRA requirements) for management of wastes generated by the remedial actions

Combined closure/source control and MNA are anticipated to meet the requirements of 40 CFR 257.97(b) and ADEM Admin. Code r. 335-13-15-.06(8)(b). In an adaptive site management process, system performance is monitored, and one or more technologies identified in this ACM will be used to supplement the remedy as soon as feasible if the system is not performing as intended or corrective action goals are not met.

Using adaptive site management, a remedial approach will be implemented, conditions monitored, and results interpreted. The framework for future decision-making is as follows. Based on monitoring data, adjustments will be made to the corrective measures as necessary, leading to continuous improvements in Site knowledge and corrective measures performance. Specifically, potential changes in Site conditions associated with pond closure may require periodic changes to the corrective measure system. Moreover, Site conditions may require the implementation of more than one corrective measure technology to meet remediation goals over the life of the project.

At the Site, Appendix IV SSLs have been identified and pond closure is underway but not complete. As soon as practical, MNA will be implemented to address the SSLs based on the current Site conditions. Using an adaptive site management approach, a remediation approach will be used whereby: 1) the corrective measures system will be implemented to address current conditions; 2) the performance of the system will be monitored and evaluated semi-annually; 3) the Site conceptual model will be updated as more data are collected; and 4) adjustment and augmentation will be made to the corrective action system to ensure that performance criteria are met.

4.1 Additional Data Needs

Additional data and analysis will be required to perform a thorough site-specific evaluation and supplemental design of groundwater corrective actions for the Site. The following provides a summary of typical additional data needed to evaluate and select a remedy system:

- Geochemical studies of groundwater and aquifer media and geochemical modeling as needed
- Subsurface hydraulic calculations or models
- Laboratory treatability studies on groundwater, aquifer media, reactive media, and potential treatment solutions for injection
- Field pilot studies based on results of laboratory treatability studies

4.2 Schedule

Table 8 provides a generalized conceptual schedule for evaluating additional information and selecting a remedy to potentially supplement the proposed corrective action.

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Tables

Table 1
Historical Groundwater Elevations Summary

Well ID	Average GW Elevation (feet MSL)	Highest GW Elevation (feet MSL)	Lowest GW Elevation (feet MSL)	GW Elevation Variation (feet)
BY-AP-MW-1	5.13	8.19	2.86	5.33
BY-AP-MW-2	4.26	7.59	2.49	5.10
BY-AP-MW-3	4.14	7.53	2.31	5.22
BY-AP-MW-4	3.99	7.41	2.10	5.31
BY-AP-MW-5	3.67	7.39	1.58	5.81
BY-AP-MW-6	3.63	7.48	1.36	6.12
BY-AP-MW-7	3.67	7.86	1.25	6.61
BY-AP-MW-8	3.46	7.90	0.92	6.98
BY-AP-MW-9	3.30	7.64	0.74	6.90
BY-AP-MW-10	3.35	7.77	0.88	6.89
BY-AP-MW-11	3.55	7.82	1.04	6.78
BY-AP-MW-12	3.23	7.43	0.73	6.70
BY-AP-MW-13	3.31	7.49	0.81	6.68
BY-AP-MW-14	2.86	6.89	0.36	6.53
BY-AP-MW-15	3.30	7.21	0.99	6.22
BY-AP-MW-16	3.75	7.34	1.76	5.58

Notes:
Source: Southern Company Services, 2019. *Plant Barry Ash Pond, 2018 Annual Groundwater Monitoring and Corrective Action Report.*

GW: groundwater
MSL: mean sea level

Table 2
Groundwater Monitoring Network Details

Well Name	Installation Date	Northing	Easting	Ground Elevation	Top of Casing Elevation	Top of Screen Elevation	Bottom of Screen Elevation	Purpose
BY-AP-MW-1	10/7/2015	362905.452	1811513.200	22.91	25.80	-10.304	-20.304	Downgradient
BY-AP-MW-2	10/7/2015	363375.014	1811104.860	21.10	23.89	-31.515	-41.515	Upgradient
BY-AP-MW-3	10/7/2015	364009.973	1810627.965	23.60	26.61	-46.581	-56.581	Upgradient
BY-AP-MW-4	10/7/2015	364620.885	1810128.368	24.05	26.97	-47.942	-57.942	Upgradient
BY-AP-MW-5	10/7/2015	365528.959	1809431.284	25.97	28.93	-30.023	-40.023	Downgradient
BY-AP-MW-6	10/7/2015	365906.041	1810555.372	23.78	26.69	-51.821	-61.821	Downgradient
BY-AP-MW-7	10/7/2015	366714.007	1811745.255	22.90	25.94	-53.98	-63.98	Downgradient
BY-AP-MW-8	10/7/2015	367064.508	1813172.112	25.57	28.45	-29.688	-39.688	Downgradient
BY-AP-MW-9	10/7/2015	366387.185	1814330.505	21.91	24.39	-37.082	-47.082	Downgradient
BY-AP-MW-10	10/7/2015	365296.811	1815400.957	23.61	26.89	-34.578	-44.578	Downgradient
BY-AP-MW-11	10/7/2015	364079.137	1815715.187	23.20	26.08	-37.999	-47.999	Downgradient
BY-AP-MW-12	10/7/2015	362704.953	1815677.689	21.24	23.88	-49.054	-59.054	Downgradient
BY-AP-MW-13	10/7/2015	361251.169	1815627.420	21.29	24.22	-39.29	-49.29	Downgradient
BY-AP-MW-14	10/1/2013	360520.621	1814694.666	8.89	11.74	-36.284	-46.284	Downgradient
BY-AP-MW-15	10/7/2015	360594.416	1813618.877	21.23	23.89	-48.791	-58.791	Downgradient
BY-AP-MW-16	10/7/2015	361610.794	1812571.016	22.05	25.01	-32.706	-42.706	Downgradient

Notes:
1. Northing and easting are in feet relative to the State Plane Alabama West North America Datum of 1983.
2. Elevations are in feet relative to the North American Vertical Datum of 1988 (ft MSL).
Source: Southern Company Services, 2019. *Plant Barry Ash Pond, 2018 Annual Groundwater Monitoring and Corrective Action Report.*

Table 3
Barry Ash Pond GWPS

Constituent Name	Units	GWPS	Reference
Antimony	mg/L	0.006	MCL
Arsenic	mg/L	0.01	MCL
Barium	mg/L	2	MCL
Beryllium	mg/L	0.004	MCL
Cadmium	mg/L	0.005	MCL
Chromium	mg/L	0.1	MCL
Cobalt	mg/L	0.01845	Background
Combined Radium 226+228	pCi/L	5	MCL
Fluoride	mg/L	4	MCL
Lead	mg/L	0.015	Rule
Lithium	mg/L	0.04	Rule
Mercury	mg/L	0.002	MCL
Molybdenum	mg/L	0.1	Rule
Selenium	mg/L	0.05	MCL
Thallium	mg/L	0.002	MCL

Note:
Source: Southern Company Services, 2018. *Plant Barry Ash Pond, 2017 Annual Groundwater Monitoring and Corrective Action Report.*

Table 4
May 2018 Assessment Sampling Results

Well ID	Purpose	Sample Date	Arsenic[1] (mg/L)	Cobalt[2] (mg/L)
BY-AP-MW-1	Downgradient	5/1/2018	0.0777	ND
BY-AP-MW-2	Upgradient	5/1/2018	0.00166 J	0.00693 J
BY-AP-MW-3	Upgradient	5/1/2018	ND	ND
BY-AP-MW-4	Upgradient	5/1/2018	ND	0.0126
BY-AP-MW-5	Downgradient	5/2/2018	0.0315	ND
BY-AP-MW-6	Downgradient	5/2/2018	ND	ND
BY-AP-MW-7	Downgradient	5/2/2018	0.0218	0.0169
BY-AP-MW-8	Downgradient	5/2/2018	0.0572	ND
BY-AP-MW-9	Downgradient	5/2/2018	0.0437	ND
BY-AP-MW-10	Downgradient	5/2/2018	0.0433	ND
BY-AP-MW-11	Downgradient	5/2/2018	0.0158	ND
BY-AP-MW-12	Downgradient	5/2/2018	0.0239	0.00271 J
BY-AP-MW-13	Downgradient	5/2/2018	0.0175	ND
BY-AP-MW-14	Downgradient	5/2/2018	0.0156	ND
BY-AP-MW-15	Downgradient	5/1/2018	0.0181	0.0298
BY-AP-MW-16	Downgradient	5/1/2018	0.0114	0.0189

Notes:
1. Groundwater protection standard for arsenic is 0.01 mg/L.
2. Groundwater protection standard for cobalt is 0.0127 mg/L.
J: Estimated value; value may not be accurate. Spike recovery or relative percent difference outside of criteria.
mg/L: milligrams per liter
ND: non-detect

Table 5
November 2018 Assessment Sampling Results

Well ID	Purpose	Sample Date	Arsenic[1] (mg/L)	Cobalt[2] (mg/L)
BY-AP-MW-1	Downgradient	11/28/2018	0.0677	ND
BY-AP-MW-2	Upgradient	11/27/2018	0.00144 J	0.0066
BY-AP-MW-3	Upgradient	11/27/2018	ND	ND
BY-AP-MW-4	Upgradient	11/27/2018	ND	0.00363 J
BY-AP-MW-5	Downgradient	11/27/2018	0.0283	ND
BY-AP-MW-6	Downgradient	11/28/2018	ND	ND
BY-AP-MW-7	Downgradient	11/28/2018	0.0209	0.0178
BY-AP-MW-8	Downgradient	11/27/2018	0.0536	ND
BY-AP-MW-9	Downgradient	11/28/2018	0.0422	ND
BY-AP-MW-10	Downgradient	11/28/2018	0.0536	ND
BY-AP-MW-11	Downgradient	11/28/2018	0.0140	ND
BY-AP-MW-12	Downgradient	11/28/2018	0.0216	0.00274 J
BY-AP-MW-13	Downgradient	11/28/2018	0.0141	ND
BY-AP-MW-14	Downgradient	11/27/2018	0.0145	ND
BY-AP-MW-15	Downgradient	11/27/2018	0.0158	0.0311
BY-AP-MW-16	Downgradient	11/27/2018	0.0108	0.0182

Notes:
1. Groundwater protection standard for arsenic is 0.01 mg/L.
2. Groundwater protection standard for cobalt is 0.01845 mg/L.
J: Estimated value; value may not be accurate. Spike recovery or relative percent difference outside of criteria.
mg/L: milligrams per liter
ND: non-detect

Table 6
Groundwater Corrective Action Evaluation Summary

Technology	Evaluation Criteria						
	Performance	Reliability	Ease or Difficulty of Implementation	Potential Impacts of Remedy	Time to Implement Remedy (Influenced by Regulatory Approval Process)	Time to Achieve Groundwater Protection Standard at the Waste Boundary	Institutional Requirements
Monitored Natural Attenuation [2]	Medium due to sandy aquifer	High due to little O&M and other potential repair needs	Easy due to minimal infrastructure (e.g., monitoring wells) needed to implement remedy	None	18-24 months	Estimated > 25 years[1]	None identified
Hydraulic Containment (pump-and-treat)	High; reduces constituents to compliance levels when online	Medium to high; system offline at times for maintenance	Moderate due to design and installation of pump-and-treat system	Pumping could impact water supply wells, if present	12-24 months	Estimated > 25 years[1]	Needs to be compatible with Site NPDES permit; would potentially need to permit withdrawals from Unit 3 aquifer
Permeable Reactive Barriers (funnel and gate)	Medium to high; reduces constituents to compliance levels downgradient of reactive barrier	Medium; reactive media will need to be replaced periodically	Moderate to moderately difficult due to depth of wall and potential need for mixed media	Will alter groundwater flow hydraulics beneath and adjacent to the Site, could be evaluated with groundwater model	24-48 months	Estimated > 25 years	None identified
Barrier Walls (in conjunction with hydraulic containment or PRB gates)	High	High due to minimal need for O&M or replacement	Moderate to moderately difficult due to depth of wall	Will alter groundwater flow hydraulics beneath and adjacent to the Site, could be evaluated with groundwater model	12-24 months	Contingent on companion technology, i.e. > 25 years for PRB walls and hydraulic containment	None identified
Geochemical Manipulation (in situ injection, spot treatment)	Medium	Medium; site geochemical conditions need to be maintained to prevent rebound	Easy to moderate due to minimal infrastructure (e.g., injection wells)	Constituents may be mobilized initially upon injection before ultimate immobilization	12-24 months	Estimated 10 years (for small, localized areas)	State Underground Injection Control permit may be required

Notes:
1. Timeframes shown are estimated based on case histories of MNA and hydraulic containment of arsenic-impacted sites. Detailed estimate of time requires further investigation.
2. MNA is often used in combination with other remedial technologies.

Table 7
Technology Advantages and Disadvantages

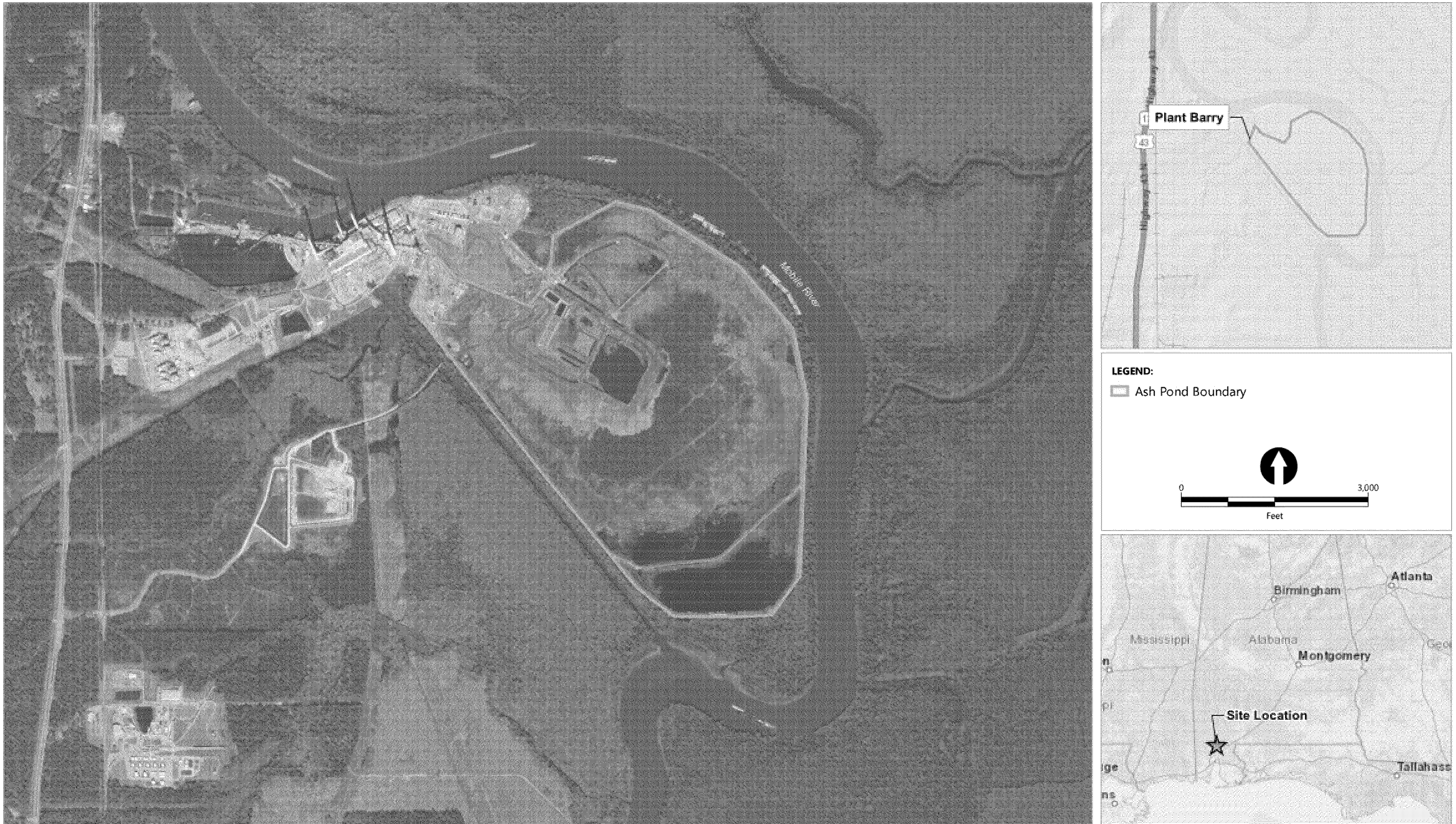
Technology	Advantages (After EPRI 2015)	Disadvantages (After EPRI 2015)
MNA	• Minimal site disruption • Sustainable • Applicable in congested, sensitive or less accessible areas where other technologies may not be feasible	• Other treatment technologies may be required
Hydraulic Containment (pump-and-treat)	• Existing onsite water treatment plant • Pump-and-treat systems are very effective at hydraulically containing impacted groundwater • Systems can be installed as deep as typical well drilling technology allows • Systems can be modified over time to increase or decrease extraction rates or modify the system to adapt changing site conditions	• More labor, O&M required than other technologies • Constituent levels can rebound if treatment is halted • System may reach a point of diminishing returns where concentrations stabilize above regulatory standards for inorganic constituents
Permeable Reactive Barriers (funnel and gate)	• Low labor, O&M requirements until media needs to be replaced • No need to manage extracted groundwater • Reduced need to dispose treatment by-products until media needs to be replaced	• Requires construction of impermeable barrier wall sections prior to PRB gates • Depth required may be at or beyond the limit of construction • Reactive media will need to be replaced at some point; used media will need to be assessed for hazardous characteristics
Barrier Walls (in conjunction with hydraulic containment or PRB gates)	• Reliable and widely accepted technology	• Construction would likely need to be from the top of the dike • Mounding, end-around, or under-flow could occur if hydraulics not evaluated properly • Depth required may be at or beyond the limit of construction
Geochemical Manipulation (in situ injection, spot treatment)	• Ability to treat small, localized areas • Minimal site disruption • Applicable in congested, sensitive or less accessible areas where other technologies may not be feasible	• Emerging technology; permanence for inorganic constituents being demonstrated • Not proven for large-scale corrective action

Notes:
EPRI: Electric Power Research Institute
MNA: monitored natural attenuation
O&M: operation and maintenance
PRB: permeable reactive barrier

Table 8
Schedule

Number	Task	Estimated Completion Date
1	Field Studies and Data Collection	June 2019 – May 2020
2	Groundwater Flow and Geochemical Modeling	June 2019 – May 2020
3	Bench Testing and Pilot Studies	October 2019 – September 2020
4	Preliminary Conceptual Design	October 2020 – March 2021

Figures



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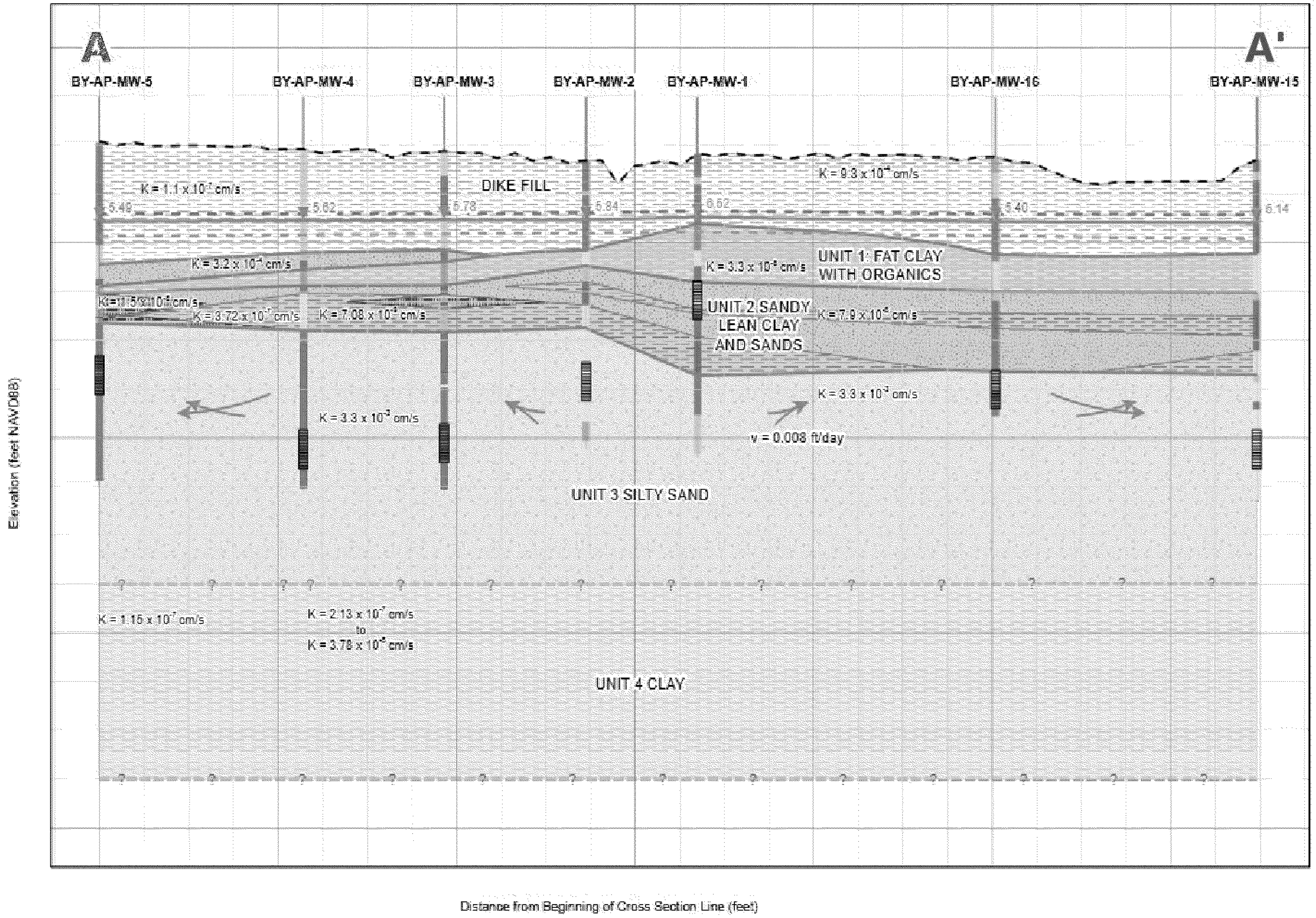
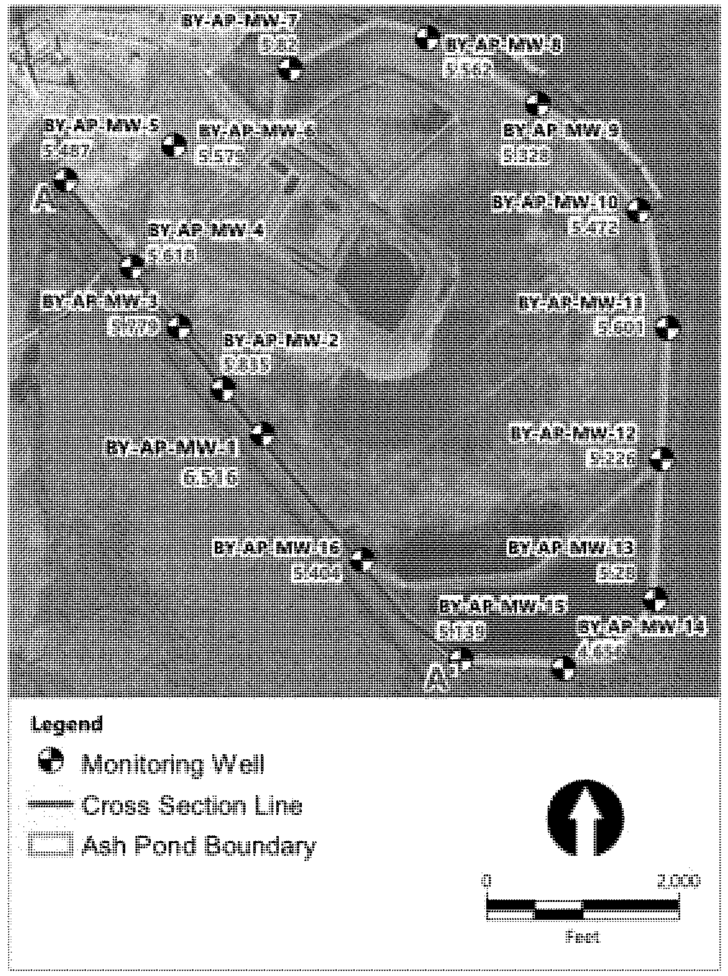
ANCHOR QEA

Figure 1
Site Location Map
Assessment of Corrective Measures
Alabama Power Company - Plant Barry





Cross-Section Legend

- Approximate Groundwater Elevation
- Artesian Well
- Approximate Groundwater Elevation
- Maximum Groundwater Elevation
- Minimum Groundwater Elevation
- Represents GW flow directly toward reader
- Screen Interval
- Ground Surface Elevation
- Monitoring Well Location
- Unit Boundary
- No Recovery
- Fat Clay
- Lean Clay
- Sandy Fat Clay
- Sandy Lean Clay
- Silt
- Elastic Silt
- Sandy Elastic Silt
- Clayey Sand
- Silty Sand
- Poorly-graded Sand with Silt
- Poorly-graded Sand
- Fill
- Unit 1: Fat Clay with Organics
- Unit 2: Sandy Lean Clay and Sands
- Unit 2: Silts
- Unit 2: Sandy Lean Clay
- Unit 3: Silty Sand
- Unit 4: Clay

NOTES:

1. Source of ground surface elevation data: Lidar
2. NAVD88 indicates North American Vertical Datum of 1988.
3. Approximate groundwater elevation data was collected on April 30, 2018.
4. Maximum and minimum groundwater elevation data were derived from the highest and lowest groundwater elevation values recorded during events spanning December 14, 2015 to April 30, 2018.
5. "v" indicates groundwater flow velocity
6. Cross-section data from *Plant Barry Ash Pond Facility Plan for Groundwater Investigation*, Southern Company Services, October 2018.

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ANCHOR QEA

Figure 2
Geologic Cross-Section
Assessment of Corrective Measures
Alabama Power Company - Plant Barry

LEGEND:

Monitoring Well

Ash Pond Boundary

Potentiometric Surface Contour (ft NAVD88)

Approximate Groundwater Flow Direction

BY-AP-MW-3 **Monitoring Well ID**
3.15 **Groundwater Elevation**

NOTES:

1. Groundwater elevations calculated from depth to water measurements collected in November 2018.
2. Groundwater elevation data from MW-1 was excluded from potentiometric surface calculations due to the screened interval not being in the Unit 3 aquifer.

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Feet

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ANCHOR QEA

Figure 3
Potentiometric Surface Map
Assessment of Corrective Measures
Alabama Power Company - Plant Barry

Lance R. LeFleur
Director

ADEM

Kay Ivey
Governor

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November 14, 2019

Mr. Dustin Brooks, P.G.
Land Compliance Supervisor
Environmental Affairs
Alabama Power Company
600 North 18th Street – 12N-0831
Birmingham, Alabama 35203

RE: **Response to CCR Documents Submitted to the Department**
Alabama Power Company

Dear Mr. Brooks:
The Solid Waste Branch has reviewed documents submitted to the Department for the James M. Barry Electric Generating Plant, the James H. Miller, Jr. Electric Generating Plant, the E.C. Gaston Electric Generating Plant, Greene County Electric Generating Plant, and the William C. Gorgas Electric Generating Plant. Please note that Plant Gadsden is not included as part of this review. These documents include Groundwater Monitoring Plans submitted as part of the permit applications, the 2018 Annual Groundwater Monitoring and Corrective Action Reports, Responses to ADEM Comments on the Groundwater Investigation Reports, Alternate Source Demonstrations, Assessments of Corrective Measures, the 2019 Semi-annual Groundwater Monitoring and Corrective Action Reports and Phase II Groundwater Delineation Plans.

As a result of the review of the above referenced documents, the Department has compiled comments and/or recommendations that are included for your review. The Department hereby requests that the Alabama Power Company submit a response addressing the comments within 45 days of receipt of this letter. If you have any questions regarding this matter, please contact the undersigned at (334) 271-7849.

Sincerely,

Heather M. Jones

Heather M. Jones, Chief
Compliance and Enforcement Section
Solid Waste Branch

Enclosure

RESPONSE TO DOCUMENTS SUBMITTED TO THE DEPARTMENT IN ACCORDANCE WITH ADEM ADMIN. CODE 335-13-15 AND ADMINISTRATIVE ORDERS NOVEMBER 2019

Alabama Power Company (APCO)

James M. Barry Electric Generating Plant, James H. Miller, Jr. Electric Generating Plant, E.C. Gaston Electric Generating Plant, Greene County Electric Generating Plant, and William C. Gorgas Electric Generating Plant

Documents Submitted and Reviewed

Groundwater Monitoring Plan
2018 Annual Groundwater Monitoring and Corrective Action Report
Response to ADEM comments on the Groundwater Investigation Report
Alternate Source Demonstrations
Assessments of Corrective Measures
2019 Semi-annual Groundwater Monitoring and Corrective Action Reports
Phase II Groundwater Delineation Plans

The documents referenced above have been submitted to the Department for each of the subject facilities in order to comply with provisions of ADEM Admin. Code ch. 335-13-15 and the Administrative Orders issued to APCO in August of 2018. The Department has reviewed the documents and as a result of that review, the Department offers the following comments. Comments for a specific facility and/or unit are identified as such.

<u>GROUNDWATER MONITORING PLAN</u>

The Groundwater Monitoring Plans (GWMPs) for each of the subject facilities were received by the Department on December 5, 2018.

<u>General Comments</u>

ADEM Admin. Code r. 335-13-15-.03(1)(a)2. requires two groundwater measurements to be taken during each of the three consecutive months of February, March, and April with no two measurements taken within any twelve day period. Groundwater elevation has been measured at several different times in different borings as they were installed. However, since the installation of all borings and groundwater monitoring wells, it does not appear that a comprehensive water level gauging has been conducted in the months of February, March, and April as required by the regulations.

ADEM Admin Code r. 335-13-15-.03(1)(a)1. requires that the hydrogeological evaluation include geologic logging, with these borings completed as piezometers. Boring logs were not submitted as part of the GWMPs. A description of the depth and construction, along with additional cross sections of the borings, are requested for each CCR unit.

Several figures, in both the GWMPs and other documents, show additional groundwater wells than those listed as compliance wells in the GWMP. Please clarify whether these wells are to be part of the monitoring network or are they merely for delineation/assessment purposes.

Additional wells may be needed at Plant Miller Ash Pond due to large spacing between MW-11 and MW-12 locations.

<u>Background Monitoring Wells</u>

The GWMPs should include background wells that accurately represent groundwater quality and that has not been affected by the CCR unit(s). The addition or relocation of background wells may be needed to determine background and adequately represent groundwater quality passing the waste boundary. Please include justifications for the background wells proposed for each of the groundwater monitoring networks.

The GWMPs should provide more information regarding how background data will be handled. The update should include a discussion on whether background data is pooled for sites with multiple background monitoring wells and a description of how background data will be updated as wells are added or removed from the network.

Statistical Analysis

Several of the GWMPs state that intrawell statistical analysis may be selected based on spatial variation between background well locations. It is noted that many of the compliance locations have been historically impacted from CCR unit(s). Typically, the use of the intrawell method for statistical analysis is precluded when a groundwater well has been impacted. With this in mind, please submit justification for appropriate statistical analysis for each CCR unit.

ADEM Administrative Code r. 335-13-15-.06(3)(f) requires that the owner or operator of a CCR unit specify in writing the statistical method to be used in evaluating groundwater data. In accordance with this rule, the Department requests the following information as it pertains to statistical analysis:

- The GWMPs should provide adequate justification for the statistical adjustments outlined in Sections 2.3 and 2.6 of the Statistical Analysis Plan. Additionally, when statistical adjustments are made, please include in the report what adjustments are used and why.
- The GWMPs should specify that a power curve will be provided with semiannual groundwater monitoring reports.
- Please indicate in the GWMPs that the Department will be notified within 14 days of detecting a statistically significant increase over background (when in detection monitoring) or the groundwater protection standard (when in assessment monitoring) per ADEM Admin. Code r. 335-13-15-.06(4)(h)3.

2018 ANNUAL GROUNDWATER MONITORING & CORRECTIVE ACTION REPORTS

The 2018 Annual Groundwater Monitoring and Corrective Action Report (GWMR) for each of the subject facilities was received by the Department on February 27, 2019.

The GWMRs suggest that the background data sets were combined to form a pooled background data set for the statistical evaluation of Appendix IV parameters. The Groundwater Monitoring Plan provides the Analysis of Variance (ANOVA) used to statistically evaluate differences in average concentrations among upgradient wells for Appendix III parameters; however, no such analysis has been provided for the Appendix IV parameters. The Department requests that APCO submit the statistical analysis used to determine non-significance between the background data sets for Appendix IV parameters.

In many cases, site-specific groundwater protection standards (GWPS) have been established for one or more constituent based on upgradient concentrations. However, APCO specifically requested, in a letter dated March 4, 2019, a variance from the requirements of ADEM Admin. Code r. 335-13-15-.06(6)(h)2., which would require the facility to use background concentrations for those constituents for which a maximum contaminant level (MCL) had not been established. In addition, APCO requested GWPSs of 6 μg/L for cobalt; 15 μg/L for lead; 40 μg/L for lithium; and 100 μg/L for molybdenum. On April 15, 2019, the Department approved the variance requests. While the Department recognizes that ADEM Admin. Code r. 335-13-15-.06(6)(h)2. allows for the use of the background concentration for each constituent, the variance request specifically exempted APCO from this requirement. The Department requests that APCO clarify their intent as it pertains to groundwater protection standards at the facility. It should also be noted that in several instances reports incorrectly state that the standards requested in the variance were used, when after a review of the data, it is clear that site-specific GWPSs were used.

In all cases where a site-specific GWPS was used, the GWPS was updated after each sampling event. Chapter 5 of the US EPA *Statistical Analysis of Groundwater Monitoring at RCRA Facilities* (Unified Guidance) recommends that background be updated every 2-3 years and only after a statistical comparison between existing background and a potential set of new data to determine if there is significance between the two sets of data, whether using interwell or intrawell analysis. The Unified Guidance further states that "adding individual observations to background can introduce subtle trends that might go undetected". As noted previously, the Department requests that the procedure for updating background be included in the revised GWMP.

There are numerous instances (as detailed below) where background wells appear to change or are misidentified. Please be advised that the reassignment of a downgradient well to an upgradient well, and vice versa, should be approved by the Department prior to the change. Also, when such a change is necessary, APCO should provide information on how historical background data will be used once a new upgradient well is established.

- Section 4.1 of the Plant Gaston Ash Pond GWMR identifies monitoring wells GN-AP-MW-1 through 3 as upgradient wells. However, Table 1 of the Report identifies monitoring wells GN-AP-MW-1 through 4 as upgradient wells.
- Section 4.1 of the Plant Gorgas Ash Pond GWMR identifies monitoring wells GS-AP-MW-8 and 13 as upgradient wells. However, Table 1 of the Report identifies monitoring well GS-AP-MW-12 as an upgradient well.
- The Plant Miller Ash Pond GWMR, as well as various other reports, identify monitoring wells MR-AP-MW-9S, MR-AP-MW-13S, GS-AP-MW-8 and GS-AP-MW-13 as upgradient wells. The response to ADEM comments on the Groundwater Investigation Report, as well as the 2019 Semi-annual Groundwater Monitoring and Corrective Action Report, indicate that monitoring wells MR-AP-MW-9S and MR-AP-MW-13S have been re-designated, by the facility, as downgradient wells. It should also be noted that monitoring wells GS-AP-MW-8 and GS-AP-MW-13 are wells located at the Plant Gorgas Ash Pond several miles away and these locations have not been approved as background locations for either plant.
- The Plant Greene GWMP identifies monitoring wells GC-AP-MW-11, 12, 23, 24 and 26-33 as upgradient wells. However, the 2018 GWMR and the 2019 Semi-annual GWMR identify wells GC-AP-MW-11, 12, and 31-33 as downgradient wells with little or no explanation for the change.

To reiterate, the addition or removal of monitoring wells as part of the GWMP, requires sufficient evidence to support the change, as well as approval by the Department. In the absence of this approval, or until such approval is granted, the monitoring wells designated in the GWMPs will be used for compliance determinations.

The Plant Barry Gypsum Pond GWMR classified BY-GSA-PZ-11 as a piezometer used in measuring the groundwater elevations at the facility. Because BY-GSA-PZ-11 is the only monitoring well providing coverage downgradient of the Gypsum Pond, the Department requests that the classification of BY-GSA-PZ-11 be revised to a downgradient monitoring well and for statistical analysis of the well data to begin once adequate background (4-8 samples) has been obtained. Furthermore, the Plant Barry Gypsum Pond Groundwater Monitoring Plan will need to be modified to reflect this change.

Monitoring wells MW 1-4 are used as upgradient wells for the Plant Gorgas CCR Landfill, Gypsum Pond, Bottom Ash Landfill and Gypsum Landfill. Table 5 of the GWMRs provides a summary of background concentrations and groundwater protection standards. However, different background values are reported for cobalt and lithium. The Department requests justification for the different reported concentrations given that the units utilize the same background wells. The background concentrations for cobalt and lithium for each of the units are summarized in the table below.

Unit	Cobalt		Lithium	
	May 2018	Nov 2018	May 2018	Nov 2018
CCR Landfill	0.347	0.386	0.237	0.323
Gypsum Pond	0.738	0.49	0.237	0.2764
Gypsum Landfill *	0.3635	0.3753	0.237	0.323
Bottom Ash Landfill	0.347	0.7643	0.237	0.323

*The Gypsum Landfill has three additional upgradient wells.

In the Plant Gaston Ash Pond GWMR, GN-AP-MW-1 is identified as an upgradient well. However, due to groundwater flow directions depicted in Figure 4 of the report, the Department requests additional information to justify utilizing GN-AP-MW-1 for determining background. Furthermore, additional wells are needed at the site to adequately determine background groundwater quality.

It appears that the reporting limits for select constituents are higher than the lowest concentration that is consistently attained by other analytical laboratories and were generally higher than the associated GWPS. It is recommended that APCO evaluate the reporting limits to ensure appropriate reporting limits are being utilized.

The Department requests that future groundwater reports include the information outlined in the March 2011 Alabama Groundwater Monitoring Reporting guidance found at www.adem.state.al.us/programs/land/landforms/ALGWMonitoringReportGuidanceMarch2011. This includes, but is not limited to, historical background data, a summary table of all detections for all constituents for a given monitoring event, and documentation of field sampling parameters. In addition, the Department requests a CD to include all tables, figures and statistical analysis for easier viewing.

RESPONSE TO ADEM COMMENTS ON THE GROUNDWATER INVESTIGATION REPORTS

The Department submitted comments dated June 20, 2019, to APCO on the May 13, 2019, Groundwater Investigation Report for each of the subject facilities. Responses to comments that are not specifically addressed here were considered adequate.

The response to ADEM comments for the Plant Barry Ash Pond indicates that horizontal delineation wells BY-AP-MW-17H and BY-AP-MW-23H will be utilized to horizontally delineate potential impacts from BY-AP-MW-17 and BY-AP-MW-5, respectively. It should be noted that BY-AP-MW-23H is not depicted in Figure 1 of the revised Groundwater Investigation Progress Report. Also, BY-AP-MW-17H is approximately 1,750ft to 2,500ft from either well. Given the estimated groundwater flow velocity of 3 feet/year, it would take approximately 580 to 880 years to reach BY-AP-MW-17H from either well. This does not appear to be sufficient for delineation purposes. In addition, no further delineation is proposed in the vicinity of BY-AP-MW-1 because groundwater flow primarily flows toward the ash pond and the well appears to be screened in a perched zone. Insufficient information has been provided to verify either claim. Considering the highest detections of arsenic at Plant Barry are from monitoring well BY-AP-MW-1, the Department requests additional information justifying APCO's proposal not to delineate arsenic impacts around BY-AP-MW-1. APCO should address the possibility that there is a mounding effect around the edges of the pond (at Plant Barry and the other facilities), which may be contributing to the arsenic concentrations. Lastly, the response indicates that further data will be collected (and reported to ADEM by September 30, 2019) to explore the source of lithium detected above the GWPS in well BY-AP-MW-7V. To date, the additional data/information has not been submitted to the Department.

Despite the APCO's response, it does not appear that full delineation of the Plant Gorgas Bottom Ash Landfill has occurred. No horizontal delineation wells and only one vertical delineation well has been installed at the facility. Please provide rationale for the limited placement of monitoring wells at the site.

At select sites, well locations where there was a lack of groundwater yield were considered successfully delineated as the lack of groundwater yield seems to indicate lack of groundwater and contaminant migration. APCO should provide data obtained from further sampling attempts or the installation of additional wells in the vicinity of the well locations in question in order to confirm this claim.

Additional delineation is necessary at all the referenced facilities. The Department recognizes that the deadlines laid out in ADEM Admin. Code ch. 335-13-15 and the Administrative Orders provided little room for multiple well installation events or weather related obstacles. However, the intent of the investigation, as stated in ADEM Admin. Code r. 335-13-15-.06(6)(g)2., is that the nature and extent of contamination must be sufficient to support a complete and accurate assessment of corrective measures. Without having the plume fully delineated or having an understanding of any possible trends in the contaminant concentrations, selection of the proposed remedy seems premature and based off insufficient data.

The Department requests that APCO proved a detailed map, such as a chloropleth map, to better illustrate the horizontal extent of contamination at the subject facilities.

ALTERNATE SOURCE DEMONSTRATIONS

Plant Gaston Ash Pond

A partial alternate source demonstration (ASD) for combined radium 226+228 in monitoring well GN-AP-MW-20 was submitted to the Department as Appendix C of the 2018 Annual Groundwater Monitoring and Corrective Action Report on February 27, 2019. While the Department agrees the radium detections may be naturally occurring, additional data and/or documentation is needed to definitively determine the source of the radium at the site.

Plant Gorgas Bottom Ash Landfill

An ASD for arsenic and lithium in monitoring wells MW-12 and MW-12V, respectively, at the Plant Gorgas Bottom Ash Landfill was submitted to the Department on July 1, 2019.

- The ASD states that arsenic occurs naturally in pyrite contained within mudstones and coal seams of the Pottsville Formation. Furthermore, the ASD claims that arsenic detections above the GWPS are isolated to MW-12. The Department has determined that insufficient information has been submitted to demonstrate that arsenic is not from the unit, especially considering the elevated levels of arsenic detected in this well.
- The ASD states that the statistically significant level (SSL) for lithium in MW-12V was the result of a statistical evaluation error. Specifically, the ASD claims lithium was not compared to the most recently updated site-specific GWPS. When compared to the latest background derived GWPS, lithium did not exceed the standard. As discussed above, the Unified Guidance recommends that background not be updated after each sampling event, but rather after several events and after a statistical evaluation to ensure there are no trends in the background data. Furthermore, the Department has not approved the proposed background wells used for the establishment of the site-specific standards.

Plant Gorgas CCR Landfill

An ASD for lithium in monitoring well MW-6 was submitted to the Department as Appendix C of the 2018 Annual Groundwater Monitoring and Corrective Action Report on February 27, 2019. The ASD states that lithium concentrations were due to natural groundwater variation at the location related to the presence of mine spoils at the site. However, monitoring well MW-6 is located side-gradient to the Plant Gorgas Bottom Ash Landfill. APCO should provide additional information demonstrating that the SSL for lithium was not due to impacts from the Bottom Ash Landfill.

Plant Gorgas CCR/Gypsum Landfills

An ASD for lithium in monitoring well MW-20 was submitted to the Department as Appendix C of the 2018 Annual Groundwater Monitoring and Corrective Action Report on February 27, 2019. The ASD states that during the May 2018 sampling event, lithium was detected at a SSL above the GWPS in well MW-20. However, no SSLs were identified for any constituent during the November 2018 sampling event. The ASD further stated waste has not been placed in the Gypsum Landfill and therefore a release from the unit cannot be the cause of the SSL for lithium. As such, the detection was attributed to an error in sampling, error in analysis, or natural variation in groundwater quality. Because monitoring well MW-20 is downgradient of the Plant Gorgas Bottom Ash Landfill, APCO should provide additional information demonstrating that the lithium SSL was not due to impacts from the Bottom Ash Landfill.

Please be advised, in accordance with ADEM Admin. Code r. 335-13-15-.06(6)(g)4.(ii), ASDs must be approved by the Department. If a successful demonstration has not been made within 90 days of finding that an Appendix IV constituent has been detected at a SSL over the groundwater protection standard, then APCO must initiate an assessment of corrective measures.

ASSESSMENT OF CORRECTIVE MEASURES

The Assessment of Corrective Measures (ACM) for the Plant Barry Ash Pond, Plant Miller Ash Pond, Plant Greene County Ash Pond, Plant Gaston Ash Pond, Plant Gorgas Ash Pond and the Plant Gorgas Gypsum Pond were received by the Department on July 11, 2019.

ADEM Admin. Code r. 335-13-15-.06(8) contains substantial requirements that must be evaluated when selecting a remedy, such as the long- and short-term effectiveness and protectiveness of the potential remedy, the effectiveness of the remedy in controlling the source to reduce further releases, among many others. The ACMs submitted by APCO do not meet the level of detail required in the regulations. Please update the ACMs to include detailed information for each requirement of this section. Furthermore, ADEM Admin. Code r. 335-13-15-.06(8)(b)3. and (b)4. require that the remedy must (1) "control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV into the environment" and (2) "remove from the environment as much of the contaminated material that was released from the CCR unit as feasible...". The ACMs evaluate a number of options, with source control (by consolidating and capping the CCR units) and monitored natural attenuation (MNA) proposed as the most effective remedy. The Department requests a more detailed justification for the proposed remedies given that source control will not be achieved for an average of 10 years and that no other mechanism is proposed to reduce the potential for further releases to the "maximum extent feasible".

In a 1999 OWSER Directive (*Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*), EPA states that "it is necessary to know what specific mechanism (type of sorption or redox reaction) is responsible for the attenuation of inorganics so that the stability of the mechanism can be evaluated" when using MNA as a corrective action. Furthermore, in EPA guidance (*Monitored Natural Attenuation of Inorganic Contaminants in Groundwater, Vol. I*) a four tiered evaluation approach is recommended. In this approach, it must be determined if the plume is stabilized or decreasing, what specific attenuation mechanism is responsible for attenuation at the site, whether the mechanism is reversible over time and whether the aquifer has sufficient capacity for the necessary attenuation mechanism. Lastly, the evaluation should include how the remediation will be monitored and what actions (and when) will be taken when the attenuation is insufficient. No such evaluation was provided or proposed in the submitted ACMs. Additionally, MNA is not appropriate in certain environments (karst terrains), for certain constituents (inorganics), and requires the aquifer have sufficient capacity for attenuation to take place. The Department requests a more detailed evaluation of the effectiveness of MNA, or any other proposed remedy, based on site specific conditions.

The ACMs state that an adaptive site management process will be utilized to determine if additional technologies will be used to supplement the proposed remedy (source control and MNA) if corrective action goals are not being met. However, the ACMs do not give specific trigger points or timeframes that will be used to determine if changes need to be made to the corrective action program. Furthermore, if adaptive management is triggered, there is no discussion on what steps may be employed and in what order. Therefore, the Department recommends that APCO re-evaluate the proposal and provide more detail on the adaptive management process including triggering scenarios/events, benchmarks, and timeframes for evaluation and implementation of alternate corrective actions.

Additionally, as stated previously, it is the Department's position that any final decision regarding corrective measures at the sites is premature, considering the Department's contention that the extent of contamination at each of the sites has yet to be fully delineated.

2019 SEMI-ANNUAL GROUNDWATER MONITORING & CORRECTIVE ACTION REPORTS

The 2019 Semi-annual Groundwater Monitoring and Corrective Action Report (GWMR) for each of the subject facilities was received by the Department on July 31, 2019. In general, many of the comments or concerns identified with the 2018 Annual Groundwater Monitoring and Corrective Action Reports still need to be addressed. Additionally, the 2019 Semi-annual GWMRs fail to include data from delineation wells, giving the appearance that these wells were not sampled during the semi-annual monitoring event. The Department requests clarification on the failure to collect data from these wells (or failure to report the data if samples were collected).

PHASE II GROUNDWATER DELINEATION PLANS

In response to Departmental comments sent regarding the Groundwater Investigation Report (dated June 20, 2019) APCO submitted Phase II Groundwater Delineation Plans for the Plant Miller Ash Pond, Plant Gaston Ash Pond, Plant Gorgas Ash Pond and the Plant Gorgas Gypsum Pond, that were received by the Department on August 15, 2019. The revised delineation plans have been reviewed by the Department and were considered adequate.

From:	Brooks, Dustin Gene
To:	Jones, Heather M
Cc:	Story, S Scott; Jenkins, Devin M; Rayfield, Jessica L; Tiblier, Brandy L; Douglas, James
Subject:	APC Response to Comment Letters
Date:	Monday, December 30, 2019 2:26:40 PM
Attachments:	Response to ADEM GADSDEN Letter 12302019 Final Signed.pdf Response to ADEM CCR 12302019 FINAL Signed.pdf

Ms. Jones,

Find attached APC's response to comments included in ADEM's letter dated 11/14/19. Please let me know if you have any questions or need additional information.

Thanks,

Dustin Brooks, P.G.
Land Compliance Supervisor
Environmental Affairs
Alabama Power Company
205-257-4194 (Office)
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December 30, 2019

Via email to HJones@adem.alabama.gov

Ms. Heather M. Jones, Chief
Compliance and Enforcement Section
Solid Waste Branch
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, Alabama 36110-2400

Re: ADEM Letter of November 14, 2019, Responding to CCR Documents Submitted to the Department for Plants Barry, Miller, Gaston, Greene County, and Gorgas

Dear Ms. Jones:

The following provides responses to comments received in a letter from the Alabama Department of Environmental Management (ADEM) Land Division dated November 14, 2019. ADEM completed review and provided comments on the following:

Alabama Power Company (APC)

- James M. Barry Electric Generating Plant
- James H. Miller, Jr. Electric Generating Plant
- E.C. Gaston Electric Generating Plant
- Greene County Electric Generating Plant
- William C. Gorgas Electric Generating Plant

Documents Submitted and Reviewed

- Groundwater Monitoring Plans
- 2018 Annual Groundwater Monitoring and Corrective Action Reports
- Response to ADEM comments on the Groundwater Investigation Reports
- Alternate Source Demonstrations
- Assessments of Corrective Measures
- 2019 Semi-annual Groundwater Monitoring and Corrective Action Reports
- Phase II Groundwater Delineation Plans

A response to the letter is required by December 30, 2019. The following presents the full text of the letter provided by ADEM in italics followed by our response indented in plain text.

GROUNDWATER MONITORING PLAN

The Groundwater Monitoring Plans (GWMPs) for each of the subject facilities were received by the Department on December 5, 2018.

General Comments

ADEM Admin. Code r. 335-13-15-.03(1)(a)2. requires two groundwater measurements to be taken during each of the three consecutive months of February, March, and April with no two measurements taken within any twelve day period. Groundwater elevation has been measured at several different times in different borings as they were installed. However, since the installation of all borings and groundwater monitoring wells, it does not appear that a comprehensive water level gauging has been conducted in the months of February, March, and April as required by the regulations.

> The referenced rule is applicable with respect to demonstrating the 5-foot location restriction from groundwater. The required groundwater level measurement was completed for the Plant Gorgas CCR Landfill and Gypsum Landfill as part of the minor modification of Permit 64-10. Groundwater Location Restriction demonstrations have been completed for the Plant Barry Gypsum Pond and Plant Gaston Gypsum Pond. None of the location restriction determinations for the other existing coal combustion residual (CCR) units referenced in the letter sought to demonstrate compliance with the groundwater location restrictions. Those units are implementing closure pursuant to State and Federal rules. Once a location restriction determination is complete, we have not understood the location restriction regulations to impose ongoing operational requirements. Instead, we have evaluated groundwater issues as required under ADEM Admin. Code r. 335-13-15-.06 and 335-13-15-.07. APC has implemented groundwater monitoring at each unit in accordance with State and Federal rules, records groundwater elevations at least semi-annually and reports those results to ADEM.

ADEM Admin Code r. 335-13-15-.03(l)(a)1. requires that the hydrogeological evaluation include geologic logging, with these borings completed as piezometers. Boring logs were not submitted as part of the GWMPs. A description of the depth and construction, along with additional cross sections of the borings, are requested for each CCR unit.

> Each Groundwater Monitoring Plan (GWMP) for the referenced facilities will be updated to include well installation logs depicting depth, well construction details, and lithology. Geologic cross-sections depicting lithology, monitoring wells, and groundwater levels will also be included in the GWMPs. Updated GWMPs will be submitted to ADEM by April 15, 2020.

Several figures, in both the GWMPs and other documents, show additional groundwater wells than those listed as compliance wells in the GWMP. Please clarify whether these wells are to be part of the monitoring network or are they merely for delineation/assessment purposes.

We recently began formatting the figures as requested and will assure that in all future submittals the figures depicting well locations will clearly identify whether a well is part of the compliance monitoring network or identify which purpose it serves. Presently, pursuant to the State and Federal CCR rules, each delineation well is sampled semi-annually as part of the assessment monitoring network. The GWMPs will be updated as described above and will clearly identify which wells will continue to be monitored as part of the assessment monitoring program.

Additional wells may be needed at Plant Miller Ash Pond due to large spacing between MW-11 and MW-12 locations.

Wells MW-11 and MW-12 were effectively located to detect potential impacts to groundwater as evidenced by ongoing assessment monitoring and delineation resulting from Appendix IV detections at those wells. One additional well location (MR-AP-MW-29H) is planned between MW-11 and MW-12. The proposed well was submitted to the Department for approval in August 2019 as part of the Phase II Groundwater Delineation Plan for the site (See Figure 4 of the Phase II Groundwater Delineation Plan). Although proposed as a delineation well, we anticipate updating the site monitoring well network to include this additional well as part of the compliance monitoring network.

Background Monitoring Wells

The GWMPs should include background wells that accurately represent groundwater quality and that has not been affected by the CCR unit(s). The addition or relocation of background wells may be needed to determine background and adequately represent groundwater quality passing the waste boundary. Please include justifications for the background wells proposed for each of the groundwater monitoring networks.

Three different criteria were used when selecting the location of background groundwater monitoring wells:

i. The well is located hydraulically upgradient of the unit being monitored or outside of the groundwater flow path of the unit;

ii. Groundwater quality data exhibited lower concentrations of monitored constituents, particularly CCR indicators such as boron, TDS and sulfate, than downgradient wells; and
iii. Groundwater quality was determined to be representative of a statistical background following screening in accordance with the Unified Guidance (*Statistical Analysis of Groundwater Data at RCRA Facilities, Unified Guidance*, March 2009, USEPA 530/R-09-007).

Background well locations and analytical data were thoroughly evaluated to assure that they represented background conditions not affected by the CCR disposal units. GWMPs will be updated to include a section justifying the background monitoring wells and data. Updated GWMPs will be submitted to ADEM by April 15, 2020.

The GWMPs should provide more information regarding how background data will be handled. The update should include a discussion on whether background data is pooled for sites with multiple background monitoring wells and a description of how background data will be updated as wells are added or removed from the network.

Background data have been screened following procedures in the Unified Guidance to assure that it is representative. Statistical methods describing background limit calculations are described in the Statistical Analysis Plans (SAPs). GWMPs will be updated to include a section summarizing the background data set and describing any pooling of background data. The GWMPs and SAPs will be updated to include procedures and criteria for updating the background data set or modifying the background well network. Updated GWMPs and SAPs will be submitted to ADEM by April 15, 2020.

Statistical Analysis

Several of the GWMPs state that intrawell statistical analysis may be selected based on spatial variation between background well locations. It is noted that many of the compliance locations have been historically impacted from CCR unit(s). Typically, the use of the intrawell method for statistical analysis is precluded when a groundwater well has been impacted. With this in mind, please submit justification for appropriate statistical analysis for each CCR unit.

Intrawell statistics are not performed on wells exhibiting pre-existing impacts. When the SAPs were developed, it was well-understood that wells with prior impacts could not be used for intrawell statistical analysis. Data was thoroughly vetted to assure that pre-existing impacts were not incorporated into an intrawell background data set. Updated

SAPs and GWMPs will include further explanation justifying the statistical method used at each site and will be submitted to ADEM by April 15, 2020.

ADEM Administrative Code. 335-13-15-.06(3)(f) requires that the owner or operator of a CCR unit specify in writing the statistical method to be used in evaluating groundwater data. In accordance with this rule, the Department requests the following information as it pertains to statistical analysis:

- *The GWMPs should provide adequate justification for the statistical adjustments outlined in Sections 2.3 and 2.6 of the Statistical Analysis Plan. Additionally, when statistical adjustments are made, please include in the report what adjustments are used and why.*

SAPs and GWMPs will be updated to include further explanation justifying the statistical adjustments outlined in Sections 2.3 and 2.6 of the SAPs. Updated GWMPs and SAPs will be submitted to ADEM by April 15, 2020. When statistical adjustments are made, a description and explanation will be included in the next subsequent groundwater monitoring report.

- *The GWMPs should specify that a power curve will be provided with semiannual groundwater monitoring reports.*

The revised GWMPs will specify that power curves will be included in each statistical analysis reports. Power curves will be included in statistical reports beginning with the 2nd semi-annual 2019 reports currently being prepared.

- *Please indicate in the GWMPs that the Department will be notified within 14 days of detecting a statistically significant increase over background (when in detection monitoring) or the groundwater protection standard (when in assessment monitoring) per ADEM Admin. Code r. 335-13-15-.06(4)(h)3.*

The GWMPs will be updated to specify that the Department will be notified of statistical exceedances identified during detection or assessment monitoring within 14 days. It is our understanding that the 14-day notification requirement is for the initial exceedance and need not be repeated for the same exceedance in subsequent monitoring events. Updated GWMPs will be submitted to ADEM by April 15, 2020.

2018 ANNUAL GROUNDWATER MONITORING & CORRECTIVE ACTION REPORTS

The 2018 Annual Groundwater Monitoring and Corrective Action Report (GWMR) for each of the subject facilities was received by the Department on February 27, 2019.

The GWMRs suggest that the background data sets were combined to form a pooled background data set for the statistical evaluation of Appendix IV parameters. The Groundwater Monitoring Plan provides the Analysis of Variance (ANOVA) used to statistically evaluate differences in average concentrations among upgradient wells for Appendix III parameters; however, no such analysis has been provided for the Appendix IV parameters. The Department requests that APCO submit the statistical analysis used to determine non-significance between the background data sets for Appendix IV parameters.

Following the Unified Guidance, spatial variation for Appendix III parameters is tested using the ANOVA – this test is not prescribed for Appendix IV constituents. Unlike the statistical evaluation of Appendix III constituents where single-sample results are compared to the statistical limit, Appendix IV analysis uses the pooled results from each downgradient well to develop a well-specific Confidence Interval that is compared to the statistical limit. That statistical limit is either the Interwell Tolerance Limit (i.e. background) calculated using the pool of all available upgradient well data (see Chapter 7 of the Unified Guidance), or an applicable groundwater protection standard such as the MCL. Appendix IV background data are screened for outliers and extreme trending patterns that would lead to artificially elevated statistical limits.

The SAP for each site includes details regarding the Appendix IV data screening and is included in the GWMP. When the SAPs and GWMPs are updated as described above, we will assure that details regarding the Appendix IV data screening are thoroughly discussed. In addition, statistical analysis of Appendix IV constituents, and the supporting data and calculations, will be included in subsequent GWMRs.

In many cases, site-specific groundwater protection standards (GWPS) have been established for one or more constituent based on upgradient concentrations. However, APCO specifically requested, in a letter dated March 4, 2019, a variance from the requirements of ADEM Admin. Code r. 335-13-15-.06(6)(h)2., which would require the facility to use background concentrations for those constituents for which a maximum contaminant level (MCL) had not been established. In addition, APCO requested GWPSs of 6 µg/L for cobalt; 15 µg/L for lead; 40 µg/L for lithium; and 100 µg/L for molybdenum.

On April 15, 2019, the Department approved the variance requests. While the Department recognizes that ADEM Admin. Code r. 335-13-15-.06(6)(h)2. allows for the use of the background concentration for each constituent, the variance request specifically exempted APCO from this requirement. The Department requests that APCO clarify their intent as it pertains to groundwater protection standards at the facility. It should also be noted that in several instances reports incorrectly state that the standards requested in the variance were used, when after a review of the data, it is clear that site-specific GWPSs were used.

We interpreted the variance as authorizing the use of Federally-published GWPS for cobalt, lead, lithium, and molybdenum in lieu of background where those levels are greater than background levels. Where background is greater than published GWPS, the rule provision allowing the use of background as a GWPS remains applicable. With the variance, the GWPS under State and Federal rules is:

1. The MCL for constituents for which an MCL has been established.
2. For the following constituents:
   i. Cobalt 6 micrograms per liter (ug/l);
   ii. Lead 15 ug/l;
   iii. Lithium 40 ug/l; and
   iv. Molybdenum 100 ug/l.
3. Background levels for constituents where the background level is higher than the MCL or rule-specified GWPS.

In all cases where a site-specific GWPS was used, the GWPS was updated after each sampling event. Chapter 5 of the US EPA Statistical Analysis of Groundwater Monitoring at RCRA Facilities (Unified Guidance) recommends that background be updated every 2-3 years and only after a statistical comparison between existing background and a potential set of new data to determine if there is significance between the two sets of data, whether using interwell or intrawell analysis. The Unified Guidance further states that "adding individual observations to background can introduce subtle trends that might go undetected". As noted previously, the Department requests that the procedure for updating background be included in the revised GWMP.

To satisfy this request, we will plan on updating Appendix IV background every 2 years after screening the data using Department-approved procedures. Procedures and criteria for updating background will be included in the updated GWMPs and SAPs. We may use updated statistical limits as a line of evidence, where appropriate, if preparing an alternative source demonstration that asserts statistical error as a cause of a statistical exceedance. Those updates would not be made to the approved background limits for compliance monitoring without Department approval.

> The principles described in Chapter 5 are generally applicable to updating background where intrawell statistical methods are being used. We believe it is appropriate to update statistical limits when a minimum of 4 new compliance samples are available, rather than after each event to avoid incorporating subtle increases into the intrawell background pool. Where interwell statistical methods are used for Appendix III constituents, it is appropriate to update the pooled upgradient background data set following each sampling event after carefully screening the data for outliers.

There are numerous instances (as detailed below) where background wells appear to change or are misidentified. Please be advised that the reassignment of a downgradient well to an upgradient well, and vice versa, should be approved by the Department prior to the change. Also, when such a change is necessary, APCO should provide information on how historical background data will be used once a new upgradient well is established.

- *Section 4.1 of the Plant Gaston Ash Pond GWMR identifies monitoring wells GN-AP-MW-1 through 3 as upgradient wells. However, Table 1 of the Report identifies monitoring wells GN-AP-MW-1 through 4 as upgradient wells.*

  Section 4.1 of the report is correct, and Table 1 contained a typographical error. Table 1 references identifying well GN-AP-MW-4 as upgradient have since been corrected. For statistical evaluation this well has always been included as a downgradient compliance point. Well GN-AP-MW-4 data has never been included in the upgradient background data set and has not been used to calculate background limits.

- *Section 4.1 of the Plant Gorgas Ash Pond GWMR identifies monitoring wells GS-AP-MW-8 and 13 as upgradient wells. However, Table 1 of the Report identifies monitoring well GS- AP-MW-12 as an upgradient well.*

  Section 4.1 of the report is correct, and Table 1 contained a typographical error. Table 1 references identifying well GS-AP-MW-12 as upgradient have since been corrected. For statistical evaluation this well has always been included as a downgradient compliance point. Well GS-AP-MW-12 data has never been included in the upgradient background data set and has not been used to calculate background limits.

- *The Plant Miller Ash Pond GWMR, as well as various other reports, identify monitoring wells MR-AP-MW-9S, MR-AP-MW-13S, GS-AP-MW-8 and GS-AP-MW-13 as upgradient wells. The response to ADEM comments on the Groundwater*

Investigation Report, as well as the 2019 Semi-annual Groundwater Monitoring and Corrective Action Report, indicate that monitoring wells MR-AP-MW-9S and MR-AP-MW-I3S have been re-designated, by the facility, as downgradient wells. It should also be noted that monitoring wells GS-AP-MW-8 and GS-AP-MW-13 are wells located at the Plant Gorgas Ash Pond several miles away and these locations have not been approved as background locations for either plant.

To assure that the background data set was representative, wells MR-AP-MW-9S and MR-AP-MW-13S were re-designated as downgradient wells based on receipt of additional monitoring data and screening of that data. This resulted in removing higher constituent concentrations from the background data set and lowering the statistical limits. A plan for additional upgradient monitoring locations was submitted to the Department in February 2019 and subsequently approved. These new background wells are currently being installed.

- *The Plant Greene GWMP identifies monitoring wells GC-AP-MW-11, 12, 23, 24 and 26-33 as upgradient wells. However, the 2018 GWMR and the 2019 Semi-annual GWMR identify wells GC-AP-MW-11, 12, and 31-33 as downgradient wells with little or no explanation for the change.*

We apologize for the confusion and will assure that this is clearly addressed in subsequent reports. The upgradient well network at the site consists of wells GC-AP-MW-23, GC-AP-MW-24 and GC-AP-MW-26 through 30. Monitoring wells GC-AP-MW-11, GC-AP-MW-12, and GC-AP-MW-31 through 33 have been re-designated as downgradient wells based on further evaluation of groundwater elevation data and monitoring results. This resulted in removing higher constituent concentrations from the background data set and lowering of statistical limits.

To reiterate, the addition or removal of monitoring wells as part of the GWMP, requires sufficient evidence to support the change, as well as approval by the Department. In the absence of this approval, or until such approval is granted, the monitoring wells designated in the GWMPs will be used for compliance determinations.

As discussed above, adjustments were made to the background networks to remove wells that, upon further evaluation, we did not believe represented background conditions. These adjustments were made based on critical review of additional monitoring data that became available during subsequent monitoring events. This was done to assure that a representative background data set was used for statistical comparisons. The GWMPs and SAPs will be updated to describe the background monitoring networks and include procedures and criteria for updating the background data set or modifying the background well network. Updated GWMPs will be submitted to ADEM by April 15, 2020.

The Plant Barry Gypsum Pond GWMR classified BY-GSA-PZ-11 as a piezometer used in measuring the groundwater elevations at the facility. Because BY-GSA-PZ-11 is the only monitoring well providing coverage downgradient of the Gypsum Pond, the Department requests that the classification of BY-GSA-PZ-11 be revised to a downgradient monitoring well and for statistical analysis of the well data to begin once adequate background (4-8 samples) has been obtained. Furthermore, the Plant Barry Gypsum Pond Groundwater Monitoring Plan will need to be modified to reflect this change.

Piezometer BY-GSA-PZ-11 will be re-designated and used as a downgradient monitoring well during the 1st semi-annual sampling event of 2020. This change will be included in the updated GWMP. Currently there are six other wells installed adjacent to the Gypsum Pond downgradient and sidegradient of the facility.

Monitoring wells MW 1-4 are used as upgradient wells for the Plant Gorgas CCR Landfill, Gypsum Pond, Bottom Ash Landfill and Gypsum Landfill. Table 5 of the GWMRs provides a summary of background concentrations and groundwater protection standards. However, different background values are reported for cobalt and lithium. The Department requests justification for the different reported concentrations given that the units utilize the same background wells. The background concentrations for cobalt and lithium for each of the units are summarized in the table below.

Unit	*Cobalt*		*Lithium*	
	May 2018	*Nov 2018*	*May 2018*	*Nov2018*
CCR Landfill	*0.347*	*0.386*	*0.237*	*0.323*
Gypsum Pond	*0.738*	*0.49*	*0.237*	*0.2764*
*Gypsum Landfill **	*0.3635*	*0.3753*	*0.237*	*0.323*
Bottom Ash Landfill	*0.347*	*0.7643*	*0.237*	*0.323*

**The Gypsum Landfill has three additional upgradient wells.*

Differences in GWPS were erroneous and the result of the upgradient statistical database not being updated with all site data. This error has since been corrected. Wells MW-1 through MW-4 are utilized as upgradient locations for the Gypsum Pond, CCR Landfill, Bottom Ash Landfill (BALF) and Gypsum Landfill at Plant Gorgas (the Gypsum Landfill includes additional background wells). The background limit and GWPS for the Gypsum

Pond, CCR Landfill, and Bottom Ash Landfill (BALF) will be consistent going forward.

In the Plant Gaston Ash Pond GWMR, GN-AP-MW-1 is identified as an upgradient well. However, due to groundwater flow directions depicted in Figure 4 of the report, the Department requests additional information to justify utilizing GN-AP-MW-1 for determining background. Furthermore, additional wells are needed at the site to adequately determine background groundwater quality.

The appropriateness and selection of site upgradient wells will be discussed in detail in the revised GWMP to be submitted to the Department by April 15, 2020. The following factors support utilizing well GN-AP-MW-1 as an upgradient background location.

- Low concentrations of Appendix III indicator parameters, as well as Appendix IV constituents at concentrations below applicable GWPSs or at concentrations below detection levels.
- Groundwater flow being generally toward well GN-AP-MW-1 from the south. A topographic high is observed immediately south of upgradient wells at the site and a localized groundwater divide or no-flow boundary occurs between the upgradient wells and the ash pond.

A plan for additional upgradient wells will be submitted to the Department along with the revised GWMP. Upon approval these locations will be installed within 180 days predicated on driller availability and site access. The updated GWMP will include procedures for screening and incorporating data from new wells into the background data set.

It appears that the reporting limits for select constituents are higher than the lowest concentration that is consistently attained by other analytical laboratories and were generally higher than the associated GWPS. It is recommended that APCO evaluate the reporting limits to ensure appropriate reporting limits are being utilized.

Reporting limits used for groundwater monitoring are practical quantitation limits (PQLs) that assure detection of statistically significant changes in groundwater quality and are consistent with those used by other laboratories for CCR compliance monitoring programs. When compared to one another, analytical laboratories commonly exhibit variability in reporting limits based on internal protocols, instrumentation, and calibration procedures -- all that are within acceptable ranges for the analytical methods and laboratory certification. After the 1st semi-annual monitoring event in 2019, laboratory PQLs were re-evaluated and, where necessary, lowered to assure that the reporting limit was below any published groundwater protection standard applicable to CCR monitoring programs.

The Department requests that future-groundwater reports include the information outlined in the March 2011 Alabama Groundwater Monitoring Reporting guidance found at www.adem.state.al.us/programs/land/landfo1111S/ALGWMonitoringReportGuidanceMarch2011. This includes, but is not limited to, historical background data, a summary table of all detections for all constituents for a given monitoring event, and documentation of field sampling parameters. In addition, the Department requests a CD to include all tables, figures and statistical analysis for easier viewing.

> Beginning with the 2nd semi-annual 2019 groundwater monitoring report, which will be submitted to the Department on January 31, 2020, reports will be formatted to include applicable information found in the referenced guidance. In addition, the reports will include a CD that will include all tables, figures and statistical analyses.

<u>RESPONSE TO ADEM COMMENTS ON THE GROUNDWATER INVESTIGATION REPORTS</u>

The Department submitted comments dated June 20, 2019, to APCO on the May 13, 2019, Groundwater Investigation Report for each of the subject facilities. Responses to comments that are not specifically addressed here were considered adequate.

The response to ADEM comments for the Plant Barry Ash Pond indicates that horizontal delineation wells BY-AP-MW-17H and BY-AP-MW-23H will be utilized to horizontally delineate potential impacts from BY-AP-MW-17 and BY-AP-MW-5, respectively. It should be noted that BY-AP-MW- 23H is not depicted in Figure 1 of the revised Groundwater Investigation Progress Report. Also, BY- AP-MW-I 7H is approximately 1,750ft to 2,500ft from either well. Given the estimated groundwater flow velocity of 3 feet/year, it would take approximately 580 to 880 years to reach BY-AP-MW-17H from either well. This does not appear to be sufficient for delineation purposes. In addition, no further delineation is proposed in the vicinity of BY-AP-MW- 1 because groundwater flow primarily flows toward the ash pond and the well appears to be screened in a perched zone. Insufficient information has been provided to verify either claim. Considering the highest detections of arsenic at Plant Barry are from monitoring well BY-AP-MW-1, the Department requests additional information justifying APCO's proposal not to delineate arsenic impacts around BY-AP-MW-1. APCO should address the possibility that there is a mounding effect around the edges of the pond (at Plant Barry and the other facilities), which may be contributing to the arsenic concentrations. Lastly, the response indicates that further data will be collected (and reported to ADEM by September 30, 2019) to explore the source of *lithium detected above the GWPS in well BY-AP-MW-7V. To date, the additional data/information has not been submitted to the Department.*

Given the ranges of hydraulic conductivity and horizontal gradients at the site, and variable distance between well BY- AP-MW-l 7H and the facility boundary, the groundwater time-of-travel to the well could be from 50 to 100 years. As depicted in the *Groundwater Investigation Report* submitted to ADEM on December 15, 2019, arsenic exceeded the GWPS at well BY-AP-MW-l 7H, thereby demonstrating its suitability as a delineation location.

The updated *Groundwater Delineation Report* submitted to the Department on December 15, 2019 includes the location of well BY-AP-MW- 23H on figures in the report.

Additional investigation was performed at location BY-AP-MW-1 to characterize the vertical extent of arsenic. Vertical delineation well BY-AP-MW-1V yielded groundwater samples with arsenic concentrations below the GWPS. Therefore, vertical delineation was complete in this area. Additional horizontal delineation from location BY-AP-MW-1 was not proposed because (1) arsenic impacts to the northwest are delineated by well BY-AP-MW-2 exhibiting arsenic concentrations below the GWPS, (2) drilling to the west and southwest is impracticable because of dense flooded wetlands, (3) delineation to the west and southwest is complete on site as evidenced by groundwater monitoring wells at the Gypsum Pond reporting arsenic concentrations below detection levels, (4) delineation to the east is impractical because of the presence of the Ash Pond, and (5) delineation to the south is superfluous because arsenic is above GWPS at all wells south of BY-AP-MW-1.

Figure 2 in the ACM presents a geologic profile along the western edge of the Ash Pond. As depicted, well BY-AP-MW-1 is installed much shallower than other site monitoring wells within sand seams found within the clay soils underlying the Ash Pond. These sand seams are likely in greater hydraulic communication with the Ash Pond, resulting in greater constituent concentrations. Figures 5 and 8 in the December updated *Groundwater Delineation Report* provide further vertical interpretation and presentation of constituent concentrations in this area.

As depicted on the referenced cross-sections, the presence of the low-permeability clay soils beneath the Ash Pond will create hydraulic separation from the uppermost aquifer and mitigate groundwater mounding and radial flow from the site. Groundwater elevation data and interpretations on groundwater elevation contour maps support the conclusion that a mound is not causing radial flow away from the Ash Pond.

Subsequent resamples collected from well BY-AP-MW-7V have not verified the presence of lithium at concentrations above the GWPS. This confirms that the initially-reported detections of lithium were likely the result of sampling or analytical error. Resample results were documented in the delineation report submitted to the Department on December 15, 2019, and no further action is proposed with respect to lithium at well BY-AP-MW-7V.

Despite the APCO's response, it does not appear that full delineation of the Plant Gorgas Bottom Ash Landfill has occurred. No horizontal delineation wells and only one vertical delineation well has been installed at the facility. Please provide rationale for the limited placement of monitoring wells at the site.

We believe that delineation of arsenic GWPS exceedances observed in well MW-12 is complete at the BALF for the following reasons:

1. Vertical delineation well MW-12V installed near MW-12 reported arsenic concentrations below the GWPS;
2. Existing monitoring wells MW-11, MW-18, MW-19, and MW-20 are located hydraulically downgradient of well MW-12 and do not report arsenic concentrations above GWPS; and
3. Well MW-10 -- located sidegradient and downgradient of well MW-12 – also reports arsenic concentrations below the GWPS.

Based on the wells described above, the horizontal and vertical extent of arsenic at the site can be adequately characterized as being in a small area around well MW-12 and is sufficient to develop a groundwater remedy plan.

At select sites, well locations where there was a lack of groundwater yield were considered successfully delineated as the lack of groundwater yield seems to indicate lack of groundwater and contaminant migration. APCO should provide data obtained from further sampling attempts or the installation of additional wells in the vicinity of the well locations in question in order to confirm this claim.

There is no known State or Federal guidance for obtaining representative groundwater quality data from wells that yield insufficient water for developing and sampling. We are reluctant to sample wells that have not been properly developed out of concern that the data will not be representative of groundwater quality resulting in false-positive or false-negative data. Following installation, a well must be properly developed by purging and surging sufficient water to remove drilling-related fines in the screened interval and help establish geochemical equilibrium resulting in representative groundwater samples. Since the referenced wells yield little water, we are unable to sufficiently purge and develop them.

Delineation efforts are proceeding at several sites. During the first half of 2020 the low-yielding or "dry" wells will be re-evaluated for use and incorporation in the monitoring system by:

- Recording groundwater elevations and comparing those results to other site monitoring wells;
- Purging the wells and documenting recharge rates;
- Comparing field parameters (temperature, pH, and conductivity) from low-yielding wells to that of site monitoring wells.

Based on this evaluation, we will develop recommendations for sampling specific wells or installing additional wells to assure that delineation at each site is complete. We will be pleased to discuss further with the Department site-specific data and findings to establish an acceptable protocol for determining where vertical delineation has sufficiently been performed.

Additional delineation is necessary at all the referenced facilities. The Department recognizes that the deadlines laid out in ADEM Admin. Code r. 335-13-15 and the Administrative Orders provided little room for multiple well installation events or weather related obstacles. However, the intent of the investigation, as stated in ADEM Admin. Code r. 335-13-15-.06(6)(g)2., is that the nature and extent of contamination must be sufficient to support a complete and accurate assessment of corrective measures. Without having the plume fully delineated or having an understanding of any possible trends in the contaminant concentrations, selection of the proposed remedy seems premature and based off insufficient data.

We agree that further delineation is necessary at the referenced facilities and are proceeding with further site investigation. State and Federal rules, as well as the Administrative Orders contain strict deadlines for completing the Assessment of Corrective Measures (ACM), irrespective of complexities associated with completing delineation at the site. We believe that the intent of the rules were satisfied: that although not fully-complete, delineation of the nature and extent was sufficient to complete the evaluation of potential remedies within the ACM.

State and Federal rules do not require the ACM to include a selected remedy. However, we understood Part C of the Administrative Orders as both being subject to a deadline and requiring the proposal of a remedy to ADEM. A proposed remedy was selected based on available information.

We concur with ADEM that additional time and information is needed to develop a final remedy plan. Following State and Federal rules, additional data will be collected following the time allotted in the rules to (1) further demonstrate the suitability of the selected remedy, (2) evaluate alternative remedies that may be used to supplement the selected remedy, and (3) develop a final groundwater remedy plan and remedy monitoring plan. Pursuant to State and Federal Rules, and the Administrative Orders, we are providing semi-annual progress reports documenting the progress made in developing a final remedy plan.

The Department requests that APCO proved a detailed map, such as a chloropleth map, to better illustrate the horizontal extent of contamination at the subject facilities.

Chloropleth, isoconcentration, cross-sections, or other maps will be prepared to illustrate the horizontal and vertical delineation of Appendix IV groundwater protection standard exceedances. These maps will be included in forthcoming Phase II delineation reports or semi-annual status reports.

ALTERNATE SOURCE DEMONSTRATIONS

Plant Gaston Ash Pond

A partial alternate source demonstration (ASD) for combined radium 226+228 in monitoring well GN- AP-MW-20 was submitted to the Department as Appendix C of the 2018 Annual Groundwater Monitoring and Corrective Action Report on February 27, 2019. While the Department agrees the radium detections may be naturally occurring, additional data and/or documentation is needed to definitively determine the source of the radium at the site.

We agree that clearly identifying the source or cause of a statistical exceedance can form the basis of an ASD. However, it is often not practicable to do so, and we do not understand ADEM's regulations, or longstanding EPA practice, to require affirmatively pinpointing the source, as long as the disposal unit is reasonably proven not to be the source. A sound demonstration can be made showing that the disposal unit was not the source without identifying the actual cause or source. Additional data will be collected, and we have set a goal to submit an updated ASD to the Department within 90 days of data receipt. Since that ASD has not yet been approved, pursuant to ADEM Admin. Code r.

335-13-1 5-.06(6)(g)4.(ii), we continue to proceed with assessment monitoring and implementing the recommendations of the ACM.

<u>Plant Gorgas Bottom Ash Landfill</u>

An ASD for arsenic and lithium in monitoring wells MW-12 and MW-12V, respectively, at the Plant Gorgas Bottom Ash Landfill was submitted to the Department on July 1, 2019.

- *The ASD states that arsenic occurs naturally in pyrite contained within mudstones and coal seams of the Pottsville Formation. Furthermore, the ASD claims that arsenic detections above the GWPS are isolated to MW-12. The Department has determined that insufficient information has been submitted to demonstrate that arsenic is not from the unit, especially considering the elevated levels of arsenic detected in this well.*

  We understand that an ASD must be persuasive enough to overcome the presumption that the disposal unit is the source of exceedances. The ASD submitted to the Department in July 2019 contained several persuasive lines of evidence that the Bottom Ash Landfill (BALF) was not the cause of statistically significant levels (SSLs) above the GWPS. These included:

  i. Direct measurement and literature documentation of elevated arsenic concentrations in geologic materials at the site;
  ii. The absence of arsenic or mobile arsenic in pore water samples collected from the BALF;
  iii. Boron isotope signature in groundwater inconsistent with CCR leachate;
  iv. Absence of arsenic SSLs in any other site monitoring well; and
  v. The lack of a geochemical signature in groundwater characteristic of CCR leachate.

  The ASD prepared for the statistical exceedances at the BALF would preclude the need for an ACM if ADEM were to approve it. We are confident that the SSLs observed in the site monitoring wells are not caused by a release from the BALF and that an ACM is not warranted. Nevertheless, pending Agency action on the ASD, the Plant Gorgas ACM will be amended to include the BALF, and further remedy evaluation will include the BALF. A revised ACM, or ACM addendum, will be submitted to the Agency by February 28, 2020.

- *The ASD states that the statistically significant level (SSL) for lithium in MW-12V was the result of a statistical evaluation error. Specifically, the ASD claims lithium was not compared to the most recently updated site-specific GWPS. When compared to the latest background derived GWPS, lithium did not exceed the standard. As discussed* *above, the Unified Guidance recommends that background not be updated after each sampling event, but rather after several events and after a statistical evaluation to ensure there are no trends in the background data. Furthermore, the Department has not approved the proposed background wells used for the establishment of the site- specific standards.*

As discussed previously, we will plan on updating Appendix IV background every 2 years after screening the data using Department-approved procedures. Procedures and criteria for updating background will be included in the updated GWMPs and SAPs. We believe it is appropriate to update a pooled upgradient background data set following each event after screening the data for outliers. Updated GWMPs and SAPs will be submitted to the Department by April 15, 2020.

Plant Gorgas CCR Landfill

An ASD for lithium in monitoring well MW-6 was submitted to the Department as Appendix C of the 2018 Annual Groundwater Monitoring and Corrective Action Report on February 27, 2019. The ASD states that lithium concentrations were due to natural groundwater variation at the location related to the presence of mine spoils at the site. However, monitoring well MW-6 is located side-gradient to the Plant Gorgas Bottom Ash Landfill. APCO should provide additional information demonstrating that the SSL for lithium was not due to impacts from the Bottom Ash Landfill.

The ASD was performed to demonstrate that the lithium observed in well MW-6 was from a source other than the CCR Landfill, thereby precluding the need to prepare an Assessment of Corrective Measures (ACM) for the unit. We are confident that the ASD provided sufficient information to support the demonstration and look forward to ADEM's determination. Nevertheless, pending agency action on the ASD, the Plant Gorgas ACM will be amended to include the CCR Landfill, and further remedy evaluation will include the CCR Landfill. A revised ACM, or ACM addendum, will be submitted to the Agency by February 28, 2020.

When schedules permit, additional information will be provided in reference to the Bottom Ash Landfill.

Plant Gorgas CCR/Gypsum Landfills

An ASD for lithium in monitoring well MW-20 was submitted to the Department as Appendix C of the 2018 Annual Groundwater Monitoring and Corrective Action Report on

February 27, 2019. The ASD states that during the May 2018 sampling event, lithium was detected at a SSL above the GWPS in well MW-20. However, no SSLs were identified for any constituent during the November 2018 sampling event. The ASD further stated waste has not been placed in the Gypsum Landfill and therefore a release from the unit cannot be the cause of the SSL for lithium. As such, the detection was attributed to an error in sampling, error in analysis, or natural variation in groundwater quality. Because monitoring well MW-20 is downgradient of the Plant Gorgas Bottom Ash Landfill, APCO should provide additional information demonstrating that the lithium SSL was not due to impacts from the Bottom Ash Landfill.

> The ASD was performed to demonstrate that the lithium observed in well MW-20 was from a source other than the Gypsum Landfill; thereby precluding the need to prepare an Assessment of Corrective Measures (ACM) for the unit. We are confident that the ASD provided sufficient information to support the demonstration and look forward to ADEM's determination. Nevertheless, pending agency action on the ASD, the Plant Gorgas ACM will be amended to include the Gypsum Landfill, and further remedy evaluation will include the Gypsum Landfill. A revised ACM, or ACM addendum, will be submitted to the Agency by February 28, 2020.
>
> When schedules permit, additional information will be provided in reference to the Bottom Ash Landfill.

Please be advised, in accordance with ADEM Admin. Code r. 335-13-1 5-.06(6)(g)4.(ii), ASDs must be approved by the Department. If a successful demonstration has not been made within 90 days of finding that an Appendix IV constituent has been detected at a SSL over the groundwater protection standard, then APCO must initiate an assessment of corrective measures.

> ASDs have been submitted for select constituents where we are confident that the data demonstrates that the cause of the statistically significant level above the groundwater protection standard (SSL) is not caused by a release from the CCR unit. Those ASDs do not encompass all parameters at all wells and will not negate the current ACMs. We recognize that the ASDs have not been approved and, pursuant to ADEM Admin. Code r. 335-13-1 5-.06(6)(g)4.(ii), are proceeding with assessment monitoring and implementing the recommendations of the ACM.
>
> As discussed above, an ASD has been prepared for SSLs at the Plant Gorgas CCR Landfill, Gypsum Landfill, and BALF. The Department's comments above indicate that additional information is required with respect to the BALF. Pending an Agency determination on the

ASD for the BALF, CCR Landfill, and Gypsum Landfill, the Plant Gorgas ACM will be amended. A revised ACM or ACM addendum will be submitted to the Agency by the earlier of February 28, 2020, if the date of ADEM's determination allows reasonable time to respond by then, or otherwise as soon as practicable after ADEM's determination.

ASSESSMENT OF CORRECTIVE MEASURES

The Assessment of Corrective Measures (ACM) for the Plant Barry Ash Pond, Plant Miller Ash Pond, Plant Greene County Ash Pond, Plant Gaston Ash Pond, Plant Gorgas Ash Pond and the Plant Gorgas Gypsum Pond were received by the Department on July 11, 2019.

ADEM Admin. Code r. 335-13-15-.06(8) contains substantial requirements that must be evaluated when selecting a remedy, such as the long- and short-term effectiveness and protectiveness of the potential remedy, the effectiveness of the remedy in controlling the source to reduce further releases, among many others. The ACMs submitted by APCO do not meet the level of detail required in the regulations. Please update the ACMs to include detailed information for each requirement of this section. Furthermore, ADEM Admin. Code r. 335-13-15-.06(8)(b)3. and (b)4. require that the remedy must (1) "control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV into the environment" and (2) "remove from the environment as much of the contaminated material that was released from the CCR unit as feasible... ". The ACMs evaluate a number of options, with source control (by consolidating and capping the CCR units) and monitored natural attenuation (MNA) proposed as the most effective remedy. The Department requests a more detailed justification for the proposed remedies given that source control will not be achieved for an average of 10 years and that no other mechanism is proposed to reduce the potential for further releases to the "maximum extent feasible".

We concur that ADEM Admin. Code r. 335-13-15-.06(8) contains substantial requirements that must be evaluated when selecting a remedy. We prepared ACM documents in light of the requirements of both the Administrative Orders and ADEM's regulations, primarily 335-13-15-.06(7) and 335-13-15-.06(8). The documents submitted to ADEM reflected a degree of detail that, in our view, was realistic in light of the deadlines included in the Orders and in 335-13-15-.06(7)(a). We agree that a more thorough and comprehensive evaluation of the criteria should be reflected in an evaluation of appropriate potential remedies and in the development and execution of a complete remedy plan.

As discussed in Section 4 of the ACMs, additional data collection is needed to thoroughly evaluate the potential remedy and develop a remedy plan – that may take a year or more. We have viewed the need for additional time and analysis at this point in the process to be consistent with the expectations of ADEM and EPA. As EPA indicated in the preamble of the federal rule, in light of the requirement for a public meeting, EPA did not establish "a deadline for completing the remedy selection process." 80 Fed. Reg. 21,301, 21,407 (Apr. 17, 2015). Again, according to the agency, "EPA understands that there are a variety of activities that may be necessary in order to select the appropriate remedy (e.g., discussions with affected citizens, state and local governments; conducting on-site studies or pilot projects)." *Id.* In light of those considerations, "EPA does not find it appropriate to set specific timeframes for selecting the remedy or to begin implementing the selected remedy." *Id.* In that context, recognizing the process could take time, EPA included a requirement of semiannual status reports and updates." *Id.* ADEM's regulations reflect that requirement at ADEM Admin. Code r. 335-13-15-.06(8)(a). Accordingly, we submitted our first *Semi-Annual Remedy Selection and Design Progress Reports* to the Department in December 2019.

We agree with the Department that additional information is needed to support a final remedy plan. Following the requirements of ADEM Admin. Code r. 335-13-15-.06(8), we will continue to collect information necessary to support developing a final remedy plan as soon as feasible and provide semi-annual status reports describing progress made. Upon developing a final remedy plan, a report will be prepared describing the remedy plan and how it demonstrably meets the requirements of the rule. In the meantime, we will be pleased to discuss with you further the activities we believe to be necessary to develop sufficient information to select an appropriate remedy plan and implement corrective action.

In a 1999 OWSER Directive (Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites), EPA states that "it is necessary to know what specific mechanism (type of sorption or redox reaction) is responsible for the attenuation of inorganics so that the stability of the mechanism can be evaluated" when using MNA as a corrective action. Furthermore, in EPA guidance (Monitored Natural Attenuation of Inorganic Contaminants in Groundwater, Vol. 1) a four tiered evaluation approach is recommended. In this approach, it must be determined if the plume is stabilized or decreasing, what specific attenuation mechanism is responsible for attenuation at the site, whether the mechanism is reversible over time and whether the aquifer has sufficient capacity for the necessary attenuation mechanism. Lastly, the evaluation should include how the remediation will be monitored and what actions (and when) will be taken when the attenuation is insufficient. No such evaluation was provided *or proposed in the submitted ACMs. Additionally, MNA is not appropriate in certain environments (karst terrains), for certain constituents (inorganics), and requires the aquifer have sufficient capacity for attenuation to take place. The Department requests a more detailed evaluation of the effectiveness of MNA, or any other proposed remedy, based on site specific conditions.*

We are familiar with the referenced guidance documents and agree with the Department that additional information is needed to evaluate and justify MNA as a final remedy plan as discussed above. As outlined in the first semi-annual status report required by ADEM Admin. Code r. 335-13-15-.06(8)(a) and 40 CFR 257.97(a), extensive data collection is planned for the first half of 2020 to begin comprehensive MNA evaluation described above. While we agree that factors such as karst terrain and inorganic constituents can be limiting factors as to the efficacy of MNA and other possible remedies, we anticipate additional analysis will demonstrate the effectiveness of the remedy plan compared to other options.

The ACMs state that an adaptive site management process will be utilized to determine if additional technologies will be used to supplement the proposed remedy (source control and MNA) if corrective action goals are not being met. However, the ACMs do not give specific trigger points or timeframes that will be used to determine if changes need to be made to the corrective action program. Furthermore, if adaptive management is triggered, there is no discussion on what steps may be employed and in what order. Therefore, the Department recommends that APCO re-evaluate the proposal and provide more detail on the adaptive management process including triggering scenarios/events, benchmarks, and timeframes for evaluation and implementation of alternate corrective actions.

Establishing trigger points and timeframes for initiating adaptive site management can only occur after a detailed groundwater remedy plan is developed, which we anticipate developing as described above in compliance with ADEM Admin. Code r. 335-13-15-.06(8)(b). Details regarding adaptive management triggers and criteria will be included in the Remedy Selection Report required by ADEM Admin. Code r. 335-13-15-.06(8)(b) and the Corrective Action Monitoring Plan required by ADEM Admin. Code r. 335-13-15-.06(9)(a)1. As outlined in the first semi-annual status report required by ADEM Admin. Code r. 335-13-15-.06(8)(a) and 40 CFR 257.97(a), extensive data collection is planned for the first half of 2020 to begin comprehensive MNA evaluation described above. In the meantime, we will be pleased to discuss these matters with you further ahead of preparing these deliverables if that is helpful to ADEM.

Additionally, as stated previously, it is the Department's position that any final decision regarding corrective measures at the sites is premature, considering the Department's contention that the extent of contamination at each of the sites has yet to be fully delineated.

We understood Part C of the Administrative Orders to require a proposed selected remedy in the ACM and included a proposed remedy for that reason. We concur that under the rules, the facility must complete the ACM, perform additional remedy-specific evaluation, hold a public meeting prior to selecting a remedy, and prepare a final report describing the remedy plan selected and how it meets the criteria. Our intent would be to proceed with further remedy-specific analysis in compliance with these requirements, including activities described above.

2019 SEMI-ANNUAL GROUNDWATER MONITORING & CORRECTIVE ACTION REPORTS

The 2019 Semi-annual Groundwater Monitoring and Corrective Action Report (GWMR) for each of the subject facilities was received by the Department on July 31, 2019. In general, many of the comments or concerns identified with the 2018 Annual Groundwater Monitoring and Corrective Action Reports still need to be addressed. Additionally, the 2019 Semi-annual GWMRs fail to include data from delineation wells, giving the appearance that these wells were not sampled during the semi-annual monitoring event. The Department requests clarification on the failure to collect data from these wells (or failure to report the data if samples were collected).

ADEM Admin. Code r. 335-13-15-.06(1)(f), which specifies the content of the annual GWMR, requires submitting all data collected during the previous year – consistent with Federal CCR rules. ADEM Admin. Code r. 335-13-15-.06(5)(g), which requires a semi-annual report to coincide with the semi-annual groundwater sampling, provides no detail regarding the required content. Semi-annual reports submitted in July 2019 contained relevant compliance monitoring data, statistical analysis results, and a description of planned compliance activities. Our intent was to comply with the rules and include all additional monitoring data from 2019 in the annual GWMR. Much of the delineation well data was submitted to the Department as part of delineation and site investigation reports. We apologize for any confusion.

Prior to the July 2019 reporting, delineation wells were installed from December 2018 through approximately March 2019. The wells were developed and sampled during the 1st semi-annual period, although not contemporaneously with the compliance monitoring network because the timing of sampling and well completion did not coincide.

All delineation wells that have been installed and developed were sampled semi-annually as part of the assessment groundwater monitoring program. Pursuant to ADEM Admin. Code r. 335-13-15-.06(1)(f), the forthcoming (January 31, 2020) annual GWMR will include all sampling and analytical data obtained in 2019. This data will also be included in forthcoming delineation and site investigation reports.

Delineation wells will continue to be sampled semi-annually as part of the ongoing assessment monitoring at the sites. Beginning with the 1st semi-annual 2020 monitoring event, future semi-annual groundwater monitoring reports will include all groundwater monitoring data obtained during the preceding semi-annual period.

PHASE II GROUNDWATER DELINEATION PLANS

In response to Departmental comments sent regarding the Groundwater Investigation Report (dated June 20, 2019) APCO submitted Phase II Groundwater Delineation Plans for the Plant Miller Ash Pond, Plant Gaston Ash Pond, Plant Gorgas Ash Pond and the Plant Gorgas Gypsum Pond, that were received by the Department on August 15, 2019. The revised delineation plans have been reviewed by the Department and were considered adequate.

We are proceeding with implementing the Phase II delineation as outlined in the plans.

We appreciate the opportunity to provide these clarifications. I will be pleased to discuss these items if that is helpful to you. If you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,

Dustin G. Brooks

Dustin G. Brooks
Environmental Affairs Supervisor

cc: Steven Burns – Balch and Bingham
Eric Wallis – Southern Company Services

Lance R. LeFleur
Director

ADEM

Kay Ivey
Governor

Alabama Department of Environmental Management
adem.alabama.gov
1400 Coliseum Blvd. 36110-2400 ▪ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ▪ FAX (334) 271-7950

March 26, 2020

Mr. Dustin Brooks, P.G.
Land Compliance Supervisor
Environmental Affairs
Alabama Power Company
600 North 18th Street – 12N-0831
Birmingham, Alabama 35203

RE: **Response to ADEM Letter**
Alabama Power Company

Dear Mr. Brooks:

The Department's Solid Waste Branch has completed its review of the Response to ADEM Letter dated, December 30, 2019, for the Alabama Power Company (APCO). Based on this review, the Department expects that the submittal of the updated Groundwater Monitoring & Statistical Analysis Plan by April 15, 2020, will clarify and resolve several concerns addressed in the ADEM November 14, 2019, letter. However, the following comments were not fully addressed by the facility response letter:

- Due to the complexity of the aquifer system at Plant Miller, the Department approved the groundwater monitoring well installation plan for three additional upgradient monitoring wells. The Department acknowledges that MR-AP-MW-9S and MR-AP-MW-13S were re-designated from upgradient to downgradient wells due to obtaining additional data. The Department requests clarification on the expected outcome of upgradient monitoring wells GS-AP-MW-8 and GS-AP-MW-13 once the three additional upgradient wells have been installed.

- The suitability of delineation wells BY-AP-MW-17H and BY-AP-MW-23H at Plant Barry Ash Pond was questioned given the estimated groundwater flow velocity of 3 feet/year according to the 2019 Semiannual Groundwater Monitoring Report dated July 31, 2019. This value was changed to 6.7 feet/year in the 2019 Annual Groundwater Monitoring Report dated January 31, 2020. Please clarify why the difference in the values from report to report and which groundwater flow velocity should be used to determine if BY-AP-MW-17H and BY-AP-MW-23H are in fact suitable delineation wells for BY-AP-MW-7 and BY-AP-MW-5, respectively.

- The Response to ADEM Letter stated that as schedules permit, additional information would be provided in reference to the Alternate Source Demonstration (ASD) Reports for the Plant Gorgas Bottom Ash Landfill, CCR Landfill and Gypsum Landfill. The Department has determined that insufficient information has been submitted at this time to demonstrate that the elevated arsenic (Bottom Ash Landfill) and lithium (CCR/Gypsum Landfills) detections are not attributed to the landfill unit and as such, the Department is unable to approve those ASDs.

- On July 11, 2019, the Department received the ACMs for the APCO facilities. In a letter dated November 14, 2019, the Department requested more details on the effectiveness of monitored natural attenuation and the adaptive management process including trigger points and timeframes for evaluation and implementation of alternate corrective measures. The December 30, 2019, response letter from the APCO recognized that a more comprehensive and detailed ACM was needed to justify the potential remedies proposed for each of the facilities in corrective measures. However, the response letter failed to include a timeline to provide those additional details that are required by ADEM Admin. Code r. 335-13-15-.06(7) and (8). The Department therefore requests the APCO to submit a timeline for submittal of the revised ACMs to address the concerns noted in the November 14, 2019, letter.

The Department hereby requests that the APCO submit a response addressing the comments noted above within 30 days of receipt of this letter. If you have any questions regarding this matter, please contact Brandy Tiblier at (334) 271-7973 or at bltiblier@adem.alabama.gov.

Sincerely,

Heather M. Jones

Heather M. Jones, Chief
Compliance and Enforcement Section
Solid Waste Branch

HMJ/bt

Organizer: Adams, Kelly[Adams.Kelly@epa.gov]
From: Adams, Kelly[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=F5B6077AB72E4A7E927452B54ACA5794-ADAMS, KELL]
Location: Microsoft Teams Meeting
Importance: Normal
Subject: Closure of CCR Waste in Place
Start Time: Thur 6/3/2021 4:00:00 PM (UTC)
End Time: Thur 6/3/2021 4:30:00 PM (UTC)
Required Attendees: Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov)

Hello everyone. Region 4 and Headquarters would like to ask Alabama a few questions about facilities electing to close with CCR waste in place.

Scott: I hope this date/time works for you. If not, please let me know and I will do my best to make accommodations. Feel free to invite anyone on your team that may be able to contribute to the conversation.

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Organizer: Adams, Kelly[Adams.Kelly@epa.gov]
From: Adams, Kelly[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=F5B6077AB72E4A7E927452B54ACA5794-ADAMS, KELL]
Location: Microsoft Teams Meeting
Importance: Normal
Subject: Closure of CCR Waste in Place
Start Time: Mon 6/14/2021 4:00:00 PM (UTC)
End Time: Mon 6/14/2021 4:30:00 PM (UTC)
Required Attendees: Anderson, Meredith; Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov; Zapata, Cesar
Optional Attendees: Jones, Heather M; Denman, Bill

-----Original Appointment-----
From: Adams, Kelly <Adams.Kelly@epa.gov>
Sent: Thursday, May 27, 2021 10:58 AM
To: Adams, Kelly; Rodgers-Smith, Delores; Michuda, Colleen E.; Huggins, Richard; Celeste, Laurel; Behan, Frank; Scott Story (sss@adem.alabama.gov); Rollins, Rhonda; sac@adem.alabama.gov; Zapata, Cesar
Cc: Jones, Heather M; Denman, Bill; Anderson, Meredith
Subject: Closure of CCR Waste in Place
When: Monday, June 14, 2021 12:00 PM-12:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

Rescheduling to accommodate as many schedules as possible. If you are unable to attend, please consider appointing someone on your behalf.

Headquarters would like to ask Alabama a few questions about facilities electing to close with CCR waste in place.

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Organizer:	Jackson, Mary[Jackson.Mary@epa.gov]
From:	Jackson, Mary[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=7B4AB98640E443848AF6EF0A7D891392-JACKSON, MARY]
Attendees:	Jackson, Mary; Yonce, Stacey; Churchill, Stephen; Jones, Heather M; Rollins, Rhonda; Simonson, Davy; Long, Michelle; Huggins, Richard; Story, S Scott; McMillan, Laura; Egetter, David; Kroske, John; McLaughlin, Amy; Adams, Kelly
Location:	Microsoft Teams Meeting
Importance:	Normal
Subject:	Discuss Alabama facilities Corrective Action issues
Start Time:	Mon 1/4/2021 8:00:00 PM (UTC)
End Time:	Mon 1/4/2021 9:00:00 PM (UTC)
Required Attendees:	Jackson, Mary; Yonce, Stacey; Churchill, Stephen; Jones, Heather M; Rollins, Rhonda; Simonson, Davy; Long, Michelle; Huggins, Richard; Story, S Scott
Optional Attendees:	McMillan, Laura; Egetter, David; Kroske, John; McLaughlin, Amy; Adams, Kelly

Good morning,

This is an invitation to listen in on a call with HQ this afternoon regarding CCR Corrective Action issues at a facility in Alabama (I am unsure of which one at this time).

Sorry I am sending you this invite so close to the meeting.

Please let me know if you have any questions or concerns,
Laura

-----Original Appointment-----
From: Jackson, Mary <Jackson.Mary@epa.gov>
Sent: Monday, December 14, 2020 3:54 PM
To: Jackson, Mary; Yonce, Stacey; Jones, Heather M; Rollins, Rhonda; Simonson, Davy; Long, Michelle; Huggins, Richard; Story, S Scott; Churchill, Stephen
Cc: McMillan, Laura
Subject: Discuss Alabama facilities Corrective Action issues
When: Monday, January 4, 2021 3:00 PM-4:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

-----Original Appointment-----
From: Jackson, Mary <Jackson.Mary@epa.gov>
Sent: Monday, December 14, 2020 3:51 PM
To: Jackson, Mary; Yonce, Stacey; Churchill, Stephen; Jones, Heather M; Rollins, Rhonda; Simonson, Davy; Long, Michelle; Huggins, Richard; Story, S Scott
Subject: Discuss Alabama facilities Corrective Action issues
When: Monday, January 4, 2021 3:00 PM-4:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

Microsoft Teams meeting

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